



Western Region

**US Army Corps
of Engineers**

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**MATOC for Construction, Adapt/Build, or
Design/Build of Tactical Equipment Maintenance
Facility (TEMF)**

**US ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
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1.0 PROJECT OBJECTIVES

The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

Comparison of Military Facilities to Civilian Facilities

Military Facility	Civilian Facility
Tactical Equipment Maintenance Facility (TEMF)	Heavy Equipment/Vehicle Maintenance Garage

It is the Army's objective that these buildings will have a 25-year useful design life before a possible re-use/re-purpose or renovation requirement, to include normal sustainment, restoration, modernization activities and a 50-year building replacement life. Therefore, the design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles.

The project site should be developed for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. **The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the lowest Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.**

1.1. SECTION ORGANIZATION

This Section is organized under 6 major "paragraphs".

- (1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable "civilian" type buildings.
- (2) Paragraph 2 describes the scope of the project.
- (3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.
- (4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.
- (5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.
- (6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

2.0 SCOPE

2.1. TACTICAL EQUIPMENT MAINTENANCE FACILITY (TEMF)

Provide Tactical Equipment Maintenance Facilities. This project type is to provide facilities for the purpose of maintaining and repairing vehicles, complete with equipment and parts storage and administrative offices. It is intended to be similar to heavy equipment or motor pool facilities in the private sector community. Assume 12 percent of personnel are female unless otherwise indicated.

The project will include TEMFs for 0 battalion(s). Specific sizing parameters for each battalion TEMF included in the project are as follows:

JLENS (71948)

TEMF size: Medium

A 10-ton bridge crane is required in this TEMF.

Number of organizational vehicles to be accommodated: 273

Organizational vehicle hardstand: 31,460 square yards

Organizational storage building: 1,400 square feet

POL storage building: 480 square feet

Hazardous waste storage building: 480 square feet

Distribution company storage building, 8000 SF w/445 SY Secure Storage, NOT required

UAV maintenance and storage, 1800SF, NOT required

POL vehicle parking IS required

SUSTAINMENT BRIGADE (55361)

TEMF size: Medium

A 10-ton bridge crane is required in this TEMF.

Number of organizational vehicles to be accommodated: 281

Organizational vehicle hardstand: 23,490 square yards

Organizational storage building: 5,600 square feet

POL storage building: 540 square feet

Hazardous waste storage building: 540 square feet

Distribution company storage building, 8000 SF w/445 SY Secure Storage, NOT required

UAV maintenance and storage, 1800SF, NOT required

POL vehicle parking IS required

THAAD BATTERY (72665)

TEMF size: Medium

A 35-ton bridge crane is required in this TEMF.

Number of organizational vehicles to be accommodated: 63

Organizational vehicle hardstand: 66,895 square yards

Organizational storage building: 9,100 square feet

POL storage building: 570 square feet

Hazardous waste storage building: 570 square feet

Distribution company storage building, 8000 SF w/445 SY Secure Storage, NOT required

UAV maintenance and storage, 1800SF, NOT required

POL vehicle parking IS required

The maximum gross area for the primary Tactical Equipment Maintenance Facilities (excluding site storage buildings) in the project is limited to 105,870 SF.

2.2. SITE:

Provide all site design and construction within the TEMF limits of construction necessary to support the new building facilities. Supporting facilities include, but are not limited to, utilities, electric service, exterior and security lighting, fire protection and alarm systems, security fencing and gates, water, gas, sewer, oil water separators, storm drainage and site improvements. Accessibility for individuals with disabilities will be provided. Antiterrorism/Force Protection measures shall also be included in the facility design in accordance with applicable criteria.

The Contractor shall be responsible for maintaining the construction site and haul route. Damages to existing sidewalks, pavements, curb and gutter, utilities, and/or landscaping within the construction limit, adjacent to the construction site, and along the Contractor's haul route resulting from the Contractor's construction activities shall be repair/replace by the Contractor at no additional cost to the Government. Prior to construction activities, the Contractor and Contracting Officer Representative shall perform an existing condition survey. At the completion of the Task Order, the Contractor and Contracting Officer representative shall perform a final condition survey to determine repair/replacement requirements.

Approximate area available for this (these) facility(ies) is shown on the drawings.

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Approximate area available 64 acres

2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: No additional requirements

2.4. FURNITURE REQUIREMENTS

Provide furniture design for all spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, any existing items to be reused, etc. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The contractor shall accommodate this effort with allowance for entry of the furniture vendor/installer onto the project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of the project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; this contract shall make the final connections to the building electrical systems under this contract. Furthermore, this contract shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CF/CI). CF/CI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package.

2.5. NOT USED

3.0 TACTICAL EQUIPMENT MAINTENANCE FACILITY (TEMF)

3.1. GENERAL

- (1) **Functional Areas.** The primary TEMF is composed of two main types of functional areas: Repair Bays (consisting of Repair areas and Maintenance areas), and the Core Area. Refer to the attached Floor Plans for recommended layout.
- (2) **Gross Building Area.** Gross areas of facilities shall be computed according to subparagraphs below. Maximum gross area limits indicated in Paragraph 2.0, SCOPE, may not be exceeded. A smaller overall gross area is permissible if all established net area program requirements are met.
 - (a) **Enclosed Spaces.** The gross area includes the total area of all floors, including basements, mezzanines, penthouses, usable attic or sloping spaces used to accommodate mechanical equipment or for storage with an average height of 6'-11" measured from the underside of the structural system and with the perimeter walls measuring a minimum of 4'-11" in height, and other enclosed spaces as determined by the effective outside dimensions of the building.
 - (b) **One-Half Spaces.** One half of the area will be included in the gross area for balconies and porches; exterior covered loading platforms or facilities, either depressed, ground level, or raised; covered but not enclosed passageways or walks; covered and uncovered but open stairs; and covered ramps.
 - (c) **Excluded Spaces.** Crawl spaces; exterior uncovered loading platforms or facilities, either depressed, ground level, or raised; exterior insulation applied to existing buildings; open courtyards; open paved terraces; roof overhangs and soffits for weather protection; uncovered ramps; uncovered stoops; and utility tunnels and raceways will be excluded from the gross area.
- (3) **Net Area.** Net area requirements for functional spaces are included in the drawings. If net area requirements are not indicated, the space shall be sized to accommodate the required function, comply with code requirements, comply with overall gross area limitations and other requirements of the RFP (for example, area requirements for corridors, stairs, and mechanical rooms will typically be left to the discretion of the Offeror).
- (4) **Deviations and Improvements.** It is the intent of this document to allow deviations and improvements to the design shown.
- (5) **Handicapped Access.** All TEMF buildings are to be handicapped accessible.
- (6) **Site Design and Functional Areas.** Site features include vehicular hardstand, utilities and site improvements.
- (7) **Adapt-Build Model.** An Adapt-Build Model for a TEMF, which contains a fully developed design, including a Building Information Model (BIM), 2-D CADD files, and specifications, can be downloaded from the following FTP site: <ftp://ftp.usace.army.mil/pub/sas/TEMF/>. This design is provided as a guide that exemplifies a technically suitable product and incorporates mandatory functional/operational requirements for a similar (although perhaps not an exact) facility to be constructed under this solicitation. It will be left to the offerors' discretion if, and how, they will use the sample design provided to satisfy the requirements of this Request for Proposal. This model is not intended to modify or over-ride specific requirements of this RFP and, under all circumstances, it will be incumbent upon the successful offeror to adhere to the site specific scope and functional/operational requirements specified within the RFP. Neither this statement of work, nor the adapt-build model, are intended to diminish the offeror's responsibilities under the clauses titled "Responsibility of the Contractor for Design," "Warranty of Design," and "Construction Role During Design." The successful offeror shall be the designer-of-record and shall be responsible for the final design and construction product, including but not limited to, adherence to the installation architectural theme, building code compliance and suitability of the engineering systems provided. The government assumes no liability for the model design provided and, to the extent it is used by an offeror, the offeror will be responsible for all aspects of the design as designer-of-record.

3.1.1. Repair Areas and Maintenance Areas

Repair areas and maintenance areas are garage areas used for service and repair of the full range of Army tactical equipment. They are single story ground floor spaces. A typical structural bay to accommodate both repair and maintenance areas is sized to measure 32' x 96'. Conceptually, this structural bay contains four 16' x 32' repair work areas, and a 32' wide vehicle corridor dividing them crosswise. The vehicle corridor also serves as a maintenance area. It accommodates 16' x 32' maintenance work areas down the length of the entire building .

Two contiguous work areas may be required to accommodate work on larger equipment, thus resulting in the need for work areas to be constructed in pairs. Repair and maintenance areas are to be free of intermediate support columns, i.e. columns are only permissible along exterior perimeter walls. This allows complete shop floor coverage by a single bridge crane for all contiguous maintenance and repair areas (each wing of the facility). TEMFs requiring four structural bays or less shall be constructed contiguously in a single wing of the facility.

(1) Repair Areas

(a) Function. Repair of vehicles as described above. Structural height shall be as required to allow minimum bridge crane hook cradle height of 20 feet (minimum of 25 feet for bays with 35-ton bridge cranes). Overhead coiling doors, 24'-0" wide x 14'-0" high, shall be provided at each end of each structural bay.

(b) Equipment. Repair Bays shall be served by a 10-ton or a 35-ton capacity traveling bridge crane with full structural bay coverage as indicated in the Architectural TEMF Features Matrix and as specified in Para. 2.1. Additional requirements are specified in the paragraph ARCHITECTURE.

(c) Provide one hose bibb and two compressed air outlets 3'-0" above the floor for each pair of repair areas.

(d) Welding/Machine Shop Area: Provide special purpose repair space to support machine shop equipment and power connectivity for portable welding equipment within one pair of repair areas, typically in repair bay farthest from the Core Area. This area will not be used exclusively for welding. It may be utilized as a repair area also and shall be equipped with all requirements for repair areas except items (e), and (j).

(e) Provide utilities for component washing and vehicle spot washing in the outermost work area of each wing of repair/maintenance areas. Provide a 5'-4" high concrete masonry wall separating the outermost bay from others to contain spray resulting from engine and component wash functions. Terminate partition to provide 6'-0" clear space at each end of the partition.

(f) In each pair of repair areas, provide electric power for user provided (GFGI) portable hydraulic lift.

(g) Provide continuous 6-inch wide trench drains with continuous grating along full width of bays at exterior doors; locate drains approximately 3'-0" inside face of exterior walls. In addition to the outside trench drains, a center trench drain running the full width of the bays is permissible to facilitate internal drainage of the facility. When a dedicated, partitioned welding area is provided, provide a solid cover to trench drain where it runs through the welding area.

(h) Each work area shall have access to NIPRNet data connection points.

(i) Provide an outlet to a vehicle exhaust evacuation system for each repair area.

(j) Tire Changing Area: Provide capability for tire changing function where shown on the TEMF Standard Drawings. Tire changing equipment shall be GFGI."

(2) Maintenance Areas

(a) Function. Maintenance areas within core area shall be equipped for inspection, oil changing and lubrication. All requirements listed above, except items (d), (e), (f), and (j) apply to the maintenance areas. Maintenance Area within the Core Area should have a minimum clear ceiling height of 14'-0" Above Finished Floor. Vehicle Exhaust within the Core Area shall be provided at the rate of only one connection for each Maintenance Bay, (one connection for each Two Maintenance Areas). Vehicle Exhaust in the High Bay Area is not required for the Maintenance Bays. Bridge crane access is not required for maintenance areas along central vehicle corridor in the core area, also, access to compressed air, water, power and data in the maintenance areas within bays shall be via connections along the nearest wall.

(b) Maintenance Pit. Provide one 40-foot long x 3'-6" wide concrete maintenance pit in the central vehicle corridor portion maintenance area within the core with stair access. Due to inside clearance for some vehicles, the maximum 3'-6" width is critical for the pit and curbing. Pit shall have non-sparking, non-slip removable floor grating approximately 4'-4" below finish floor elevation, with concrete pit floor below sloping to sump. Provide sump pump, see Paragraph 3.1.8(4) Plumbing for additional information. Provide compressed air outlet at two places in the pit. When not in use, pit shall be provided with removable cover capable of supporting pedestrian traffic. Provide minimum 4-inch high steel angle curb surrounding pit opening. Pit cover panels to be light enough to be handled by a maximum of two personnel.

(c) POL Hose Reels. Provide two POL dispensing points mounted to the wall of the maintenance area. They should be spaced along the length of the pit. Hose and reel assembly shall be heavy duty, designed for the applicable fluid or oil. Provide shutoff valve at reel. Provide distribution for grease, engine oil, gear oil, transmission fluid, and antifreeze.

(3) Circulation Bays

(a) Provide an 8' wide x 96' long structural bay between each wing of repair bays and the core area to facilitate pedestrian egress from the building and shall conform to OSHA requirements.

(b) Equipment. Provide 4'-0" high x 8'-0" wide framed tack board (for 'safety board') mounted on wall along the circulation bay near the tool room. Provide one permanently installed emergency eyewash, hand held drench hose and shower station at each circulation bay that is adjacent to a core area and provide additional emergency eye wash, hand held drench hose and shower stations in other bays as required per OSHA standard 1910.151(c) and ANSI Z358.1. Provide one or more emergency eyewash, hand held drench hose and shower stations in Consolidated Bench Repair when the equipment being serviced or solvents being used generate this requirement. Locate emergency wash stations in accordance with OSHA standard 1910.151(c) and ANSI Z358.1. Per OSHA 1910.151(c) emergency eyewash/shower units should be located such that a worker can reach one in 10 seconds. ANSI Z358.1 gives a guideline of 55 feet to meet this requirement.

3.1.2. Core Areas:

Core areas are arranged in one and two story configurations (refer to the attached floor plans for preferred layouts). Internal walls within the core should be non-load bearing to the extent possible to allow future rearrangement of spaces.

(1) Administration and Shop Control. Office space to accommodate foremen, production control, and clerical personnel. Provide one space per core; may be located on first or second floor but shall be accessible to the physically disabled. Provide counter and pass-through window between this room and the customer Waiting Area; size pass-through window to accommodate transfer of 30-inch by 30-inch items, and layout the area outside window so that two people can stand at the window and be out of the corridor traffic pattern. Provide viewing windows from administration and shop control space into the repair areas.

(2) Training Room. The training room space is intended to facilitate the training mission for maintenance personnel. This space is to be divided into two training areas with an operable folding partition (movable wall) having a sound isolation of STC 45, minimum. Provision shall be made to accommodate up to 30 students for computer based training, including power and data connections for each student.

(3) Consolidated Bench. Shop space for unit-level maintenance of electronics, optics, and other gear. Locate on first floor. A sound transmission coefficient (STC) greater than or equal to 45 is required for the walls and floor/ceiling assemblies surrounding the Consolidated Bench space.

(a) Equipment. Provide an overhead coiling door 10'-0" wide x 10'-0" high.

(b) Furnishings/Fixtures. See Table 7 for furnishings. Provide 16 SF of bench space for each person assigned to this area. Provide capabilities shown in the features matrix for each work space.

(c) Provide operable exterior windows. Provide at least one window with clear view and unobstructed line of sight out of the building to a minimum of 800 feet for testing weapon sights.

(4) Tool Room. Designated space for the issue and secure storage of unit common tool kits, as well as supplemental tool kits and individual tools shared by shop personnel. Direct covered access from the tool room to the SATS containers (described below) on the exterior of the building is required. Provide lockable pair of personnel doors and pass-through opening with impact resistant counter and metal overhead lockable coiling shutter between Tool Room and Corridor.

(a) Standard Automotive Tool Set (SATS). The SATS is a unit-owned (i.e. GF/GI) containerized tool system with the dimensions of 8' x 20' x 8' high. An exterior hardstand storage area adjacent to the Tool Room shall be provided for three SATS containers. Connectivity to building and installation network is required. SATS are accessed from the end. Provide wall mounted awning with minimum 14-foot clear height above hardstand for weather protected entry into SATS containers. The technical manual for SATS is TM 9-4910-783-13&P.

(5) Tool Box Storage. Provide one Tool Box Storage Room for each wing of Repair Areas (if Repair Areas are located on both sides of a core, each side of core shall have a Tool Box Storage Room). Tool Box Storage is provided for personnel working inside the maintenance complex in the Repair Areas and the Consolidated Bench for the storage of individually assigned or personal (Contractor) tools requiring security. Provide lockable personnel door with closer between Tool Box Storage and Circulation Bay.

(6) Combat Spares. Storage and issue of Prescribed Load List (PLL) and shop stock items kept in stock at all times because of demand or management decisions. Direct covered access from the Combat Spares room to the

ASL-MS containers (described below) on the exterior of the building is required. Provide lockable pair of personnel doors so to accommodate 48" x 48" x 74" ASL-MS repair parts bins and shelving modules, and pass-through opening with impact resistant counter and overhead lockable coiling shutter between Combat Spares and Corridor.

(a) Authorized Stockage List - Mobility System (ASL-MS). Similar to the SATS, the ASL-MS is a unit-owned (i.e. GF/GI) 8' x 20' x 8' high container for repair parts. An exterior hardstand storage area adjacent to the Combat Spares room shall be provided for three ASL-MS containers. ASL-MS are accessed from the side. Provide sufficient aisles between ASL-MS for access. Provide wall mounted awning with minimum 14-foot clear height above hardstand for weather protected entry into ASL-MS containers. Provide lockable pair of personnel doors at building exterior to accommodate large bulk portable tools and equipment, and ASLMS repair parts modules. The technical manual for ASL-MS is TM 9-5411-236-13&P.

(7) Latrine, Shower and Locker Rooms

(a) Latrines. Provide separate latrines for men and women on each floor. Provide water closets, urinals, lavatories and drinking fountains in accordance with established layouts and referenced codes.

(b) Shower and Locker Rooms. Provide a Men's Shower and Locker Room and Women's Shower and Locker Room. Locate on first floor of each core, sized to accommodate the number of lockers and showers indicated. Shower and locker area shall be adjacent to and connect to the latrine area. Provide individual shower compartments (3'-0" x 3'-0") in the number indicated on the drawings. Provide a single tier steel locker for each non-administrational occupant of the building, minimum size 1'-0" wide x 1'-6" deep x 6'-0" high.

(8) Break, Training, and Conference (BTC). Locate this room on same floor as Admin and Shop Control.

(a) Furnishings. Provide kitchen, base and wall cabinets and 30-inch deep countertop minimum 10'-0" long.

(b) Equipment. Provide stainless steel two-compartment sink.

(c) Allow space and hookups for vending machines, refrigerator and microwave.

(9) Vaults. All vault walls, floors and ceilings shall be constructed in compliance with appropriate requirements referenced below. Provision for a user provided (GFGI) intrusion detection system including motion detectors, door alarm, and camera, is required.

(a) Weapons Storage Vault. Provide secure storage of weapons being repaired, especially vehicle-mounted weapons such as machine guns and firing port weapons. Weapons vault walls, floors and ceilings shall be constructed in compliance with AR 190-11, Physical Security of Arms, Ammunition, and Explosives. An option exists for use of prefabricated, modular vaults conforming to Fed. Spec. AA-V-2737 requirements. Provide a GSA-approved Class 5 Armory vault door with lock in accordance with Fed. Spec. AA-D-600D and a "Dutch door" style day gate. Provide an internal wire mesh partitioned space or provide space for GFGI lockable cabinets IAW installation requirements to accommodate armorer's tool kits, spare arms parts, machine gun barrels and major subassemblies. Coordinate arms rack anchor rings, common storage racks, etc with user.

(b) COMSEC Vault. Provide secure storage of communications/cryptology equipment. Room must have a minimum 8-foot dimension. Refer to Physical Security Standards of Appendix D of AR 380-40, Policy for Safeguarding and Controlling Communications Security (COMSEC) Material (FOUO).

(10) Nonsensitive Secure Storage. Nonsensitive Secure Storage shall be constructed to meet Secure Storage standards for Risk Level II per AR 190-51, Security of Unclassified Army Property.

(11) Telecommunications- Room-. Telecommunications rooms shall be provided for voice and data. There shall be a minimum of one room on each floor, located as near the center of the building as practicable, and stacked between floors. The telecommunications rooms shall be designed in accordance with the Technical Guide for Installation Information Infrastructure Architecture I3A Criteria and ANSI/EIA/TIA-569-B. SIPRNET Room shall also be provided for future SIPRNet connectivity in accordance with the Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNet).

(12) Non-Assignable Spaces and Gross Area. The items below account for additional gross area within the core that is not specifically listed in the spaces above. These items may also vary in size contingent on site, climate, type and use.

(a) Stairwells. Design in accordance with model and local building codes.

(b) Elevator. Provide one passenger elevator in each two-story building. Elevator machine room is also part of the gross area of the core.

(c) Common Circulation Corridors. All circulation corridors shall be a minimum of 6 feet wide.

- (d) Waiting Area. Locate adjacent to Admin and Shop Control pass-through window off of corridor. Size Waiting Area for the seating of a minimum of four persons.
- (e) Janitorial Spaces. Provide one janitorial space as shown on drawings with mop sink and heavy duty shelving. Expansion of the Janitorial Space to include a recycling function is optional.
- (f) Mechanical Rooms. Utility space must be provided for heating and cooling equipment. Where feasible, vertically stack like utility spaces if located on two floors. Locate first floor mechanical rooms adjacent to exterior walls for external maintenance access and ventilation. See paragraph 3.1.7 Heating, Ventilation, and Air Conditioning (HVAC) Systems, for additional requirement. Walls and floor/ceiling assemblies enclosing mechanical room shall have a sound transmission class (STC) rating of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E 90, and an impact insulation class (IIC) rating of 50 (45 if field tested) when tested in accordance with ASTM E 492.
- (g) Electrical Rooms. Locate first floor electrical rooms adjacent to exterior walls for external maintenance access and ventilation.
- (h) Fluid Distribution Room. Provide a room to house the POL central distribution equipment and unused POL storage containers (typically 55-gallon drums) for five types of lubricants/fluids. Fluids shall be dispensed by automotive lubricant type air driven pump assemblies. Motor shall be heavy-duty compressed air driven reciprocating action. For antifreeze unit all parts shall be corrosion resistant. Locate near maintenance pit to minimize length of fluid distribution lines. Compliance with UFC 3-600-01, NFPA 30, and 29 CFR 1910.106 is mandatory. Provide secondary containment in compliance with applicable federal and state environmental regulations. Square footage for this space is part of the gross area for the core.

3.1.3. Site Functional Area

- (1) Dock. Provide one docking location for maintenance and electronic testing of specialized, permanently vehicle mounted, communications equipment. Provide equipment power connections and grounding points for vehicle degauss and individual personnel static discharge protection of equipment.
- (2) Organizational Vehicle Hardstand. This area consists of a rigid concrete paved area used for parking assigned vehicles (wheeled and heavy and tracked), commercial vehicles (Contractor support), trailers and generators. Organizational vehicle hardstand includes building aprons, parking spaces, and circulation lanes on site.
 - (a) Tactical/Military and Commercial Vehicle Parking. Maximize vehicle parking and traffic flow to best support the operation of the TEMF.
 - (b) POL Vehicle Parking Area. Parking for POL vehicles is considered separate from other organizational vehicle parking and shall be segregated from other vehicle parking areas.
 - (c) Dead Line Vehicle Parking. Parking for vehicles waiting for parts or for work to be performed. One dead line parking space for every pair of repair areas and shall be located in parking areas adjacent to repair bays that will service them.
 - (d) Building Aprons. Provide concrete pavement for aprons associated with each of the facilities located in the maintenance complex.
- (3) Site Storage
 - (a) Hazardous Waste Storage Building. Provide a building with solid walls and roof. It is used to temporarily store used lubricants, flammable solvents, dry sweep, etc. A unit is authorized 60 square feet for each 25 vehicles, or part thereof, which it maintains. A minimum of 120 square feet of hazardous waste storage space will be provided. The specific requirement for this project is specified in Para. 2.1. Provide secondary containment in compliance with applicable federal and state environmental regulations. Compliance with UFC 3-600-01, NFPA 30, and 29 CFR 1910.106 is mandatory. Maintain minimum separation distance from other buildings in accordance with the IBC in order to eliminate the need for automatic sprinkler protection. Pre-fabricated, fire-rated, self-contained, moveable steel safety storage buildings are permitted as an option. Minimum size of 120 SF per container, though multiple containers may add up to the total quantity required per satellite accumulation area.
 - (b) POL Storage Building. Provide a building for the storage of oil, lubricants, and flammable solvents for daily use. A unit is authorized 60 square feet for each 25 vehicles, or part thereof, which it maintains. A minimum of 120 square feet of oil storage space will be provided. The specific requirement for this project is specified in Para. 2.1. Provide an access apron at the entry of this building. Provide secondary containment in compliance with applicable federal and state environmental regulations. Compliance with UFC 3-600-01, NFPA 30, and 29 CFR 1910.106 is

mandatory. Maintain minimum separation distance from other buildings in accordance with the IBC and local codes in order to eliminate the need for automatic sprinkler protection. Pre-fabricated, fire-rated, self-contained, moveable steel safety storage buildings are permitted as an option. Minimum size of 120 SF per container, though multiple containers may add up to the total quantity required per satellite accumulation area.

(c) Organizational Storage Building. This building is for storage of deployment equipment. The size of this facility is determined by the organizational structure and the number of organizational vehicles; specific to each project. Provide a 10' x 10' coiling door and a personnel door for each 700 SF of company supply area along one side of building. Provide internal wire or secure partitions between each 700 SF space. Floor area of building shall be as specified in the project scope of work. Building shall be approximately 25 feet deep. The floor system of this facility should be designed for fork-lift lifting.

(d) Distribution Company Storage Facility. Not required

(e) Secure Open Storage. Not required

(f) UAV Maintenance and Storage Building. Not required

(g) Used Oil Storage Tank(s). Provide one 500-gallon above-ground used engine oil storage tank at the end of the Repair Areas. Tank shall be constructed of non-corrosive material. Provide secondary containment in compliance with applicable federal and state environmental regulations. Tank construction and location shall comply with IBC requirements. Preferred location is adjacent to the end repair area. Used oil, waste fuel, and used engine coolant storage tanks should be co-located, if possible.

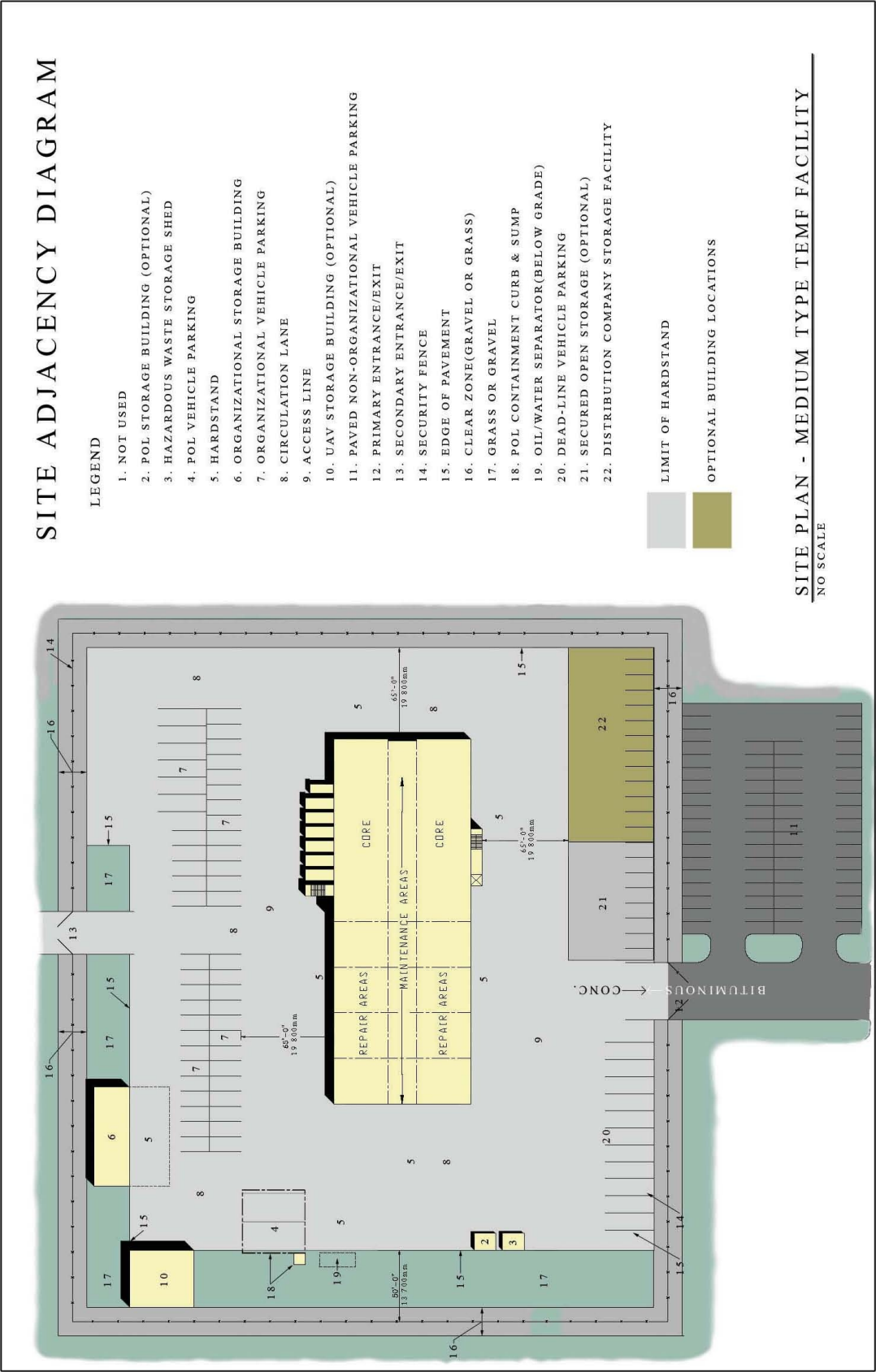
(h) Used Engine Coolant (antifreeze) Storage Tank(s). Provide one 500-gallon above-ground used engine coolant storage tank at the end of the Repair Areas. Tank shall be constructed of non-corrosive material. Provide secondary containment in compliance with applicable federal and state environmental regulations. Tank construction and location shall comply with IBC requirements. Preferred location is adjacent to the end repair areas. Used oil, waste fuel, and used engine coolant storage tanks should be co-located, if possible.

(i) Out of Spec Waste Fuel Tank(s). Provide one 500-gallon above-ground Out-of-Spec Waste Fuel Tank at the end of Repair Areas. Tank shall be constructed of non-corrosive material. Provide secondary containment in compliance with applicable federal and state environmental regulations. Tank construction and location shall comply with IBC requirements. Preferred location is adjacent to the end repair area. Used oil, waste fuel, and used engine coolant storage tanks should be co-located, if possible.

(4) Entrance Drives. Provide primary and secondary entrance drives to connect organizational vehicle hardstand to existing roads and/or tank trails.

(5) Privately Owned Vehicle (POV) Parking. Provide POV parking at the rate of 56% of the total assigned personnel (this is predicated on a parking rate of 50% for military personnel and 100% for civilian employees).

3.1.4. Site Design The following drawing should be used to associate relative adjacencies for site structures.



(1) Hardstand. All hardstand areas shall be rigid concrete pavement. Pavement design for organizational vehicle areas shall be designed to support the vehicles assigned to this facility and the heaviest vehicle at the

installation. See appendix for Organizational Vehicle assigned to this facility. The parking layout and configuration shall be adjusted as necessary to for the site limits and space provided.

- (2) Antiterrorism and Force Protection. Each project should be evaluated for security requirements in accordance with UFC 4-010-01. Minimum requirement is a security fence at the site perimeter consisting of 7-foot high chain link fabric plus a single outrigger with 3-strand barbed wire, designed in accordance with STD 872-90-03, FE-6, Chain-Link Security Fence Details. A zone cleared of trees and shrubs, 20 feet wide inside the fence and 10 feet wide outside the fence is required. The clear zone shall be gravel underlain by a synthetic fabric. The clear zone shall be treated with herbicides to discourage vegetative growth. Manually operated vehicular gates, approximately 30 feet wide overall, shall be provided at each vehicle entrance/exit.
- (3) Storm Water Management. Site storm water management may require controls on the peak flow that can be discharged. Installations are required to have a storm water pollution prevention plan. Implement the applicable portions of this plan using best management practices. Segregate drainage from areas likely to be contaminated (e.g., fueling area). Provide treatment for contaminated water prior to its discharge. Maintenance should not be performed outside the primary facility.
- (4) Storm Drainage System. Construction and material specified for storm drainage installation shall be per the State's DOT requirements. All storm drainage lines constructed under organizational vehicle hardstand, entrance drives, and other surfaces subject to vehicular traffic shall be reinforced concrete pipe with watertight joints. See paragraph 6 for additional storm drainage system requirements.
- (5) Oil/Water Separator. One or more oil/water separators are required to remove, oil, lubricants, floatables, and grit from contaminated water sources (e.g., repair and maintenance areas, POL fluids distribution, etc.). Oil/water separators shall be designed in accordance with local codes and standard industry practice for the specific waste stream to be treated. Minimize maintenance requirements and locate oil/water separators to minimize pipe runs, provide vehicular access, and built out of circulation areas.
- (6) Used and Waste Oil, Antifreeze, Solvents, Cleaning Compounds, and Hazardous Materials. Hazardous materials generated in the course of maintenance operations shall be classified in accordance with 40 CFR 261. Criteria for short term storage (less than 90 days) of hazardous materials is provided in 40 CFR 262. Long-term storage is not authorized for TEMF facilities. The installation Defense Resources Management Office has responsibility for long term storage. Long term storage of hazardous materials is governed by 40 CFR 264.
- (7) Primary and Secondary drives. Provide a primary and secondary entrance drive into the organizational vehicle hardstand area. The primary and secondary entrance drives shall be 30 feet wide.
- (8) Organizational Vehicle hardstand. Organizational vehicle pavement grades shall provide positive surface drainage with a 1 percent minimum slope in the direction of drainage. Maximum pavement slope shall be 2 percent.
- (9) Circulation Lane. Organizational vehicle parking circulation lanes shall be 20 feet wide when lanes are located adjacent to TEMF aprons. Parking stalls within the hardstand are to be placed back-to-back with circulation lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles more than 18 feet long.
- (10) Tactical/Military Vehicle Parking. Tactical/Military Vehicle Parking spaces shall be spaced with side clearances of 3 feet and end clearances of 2 feet.
- (11) POL Vehicle Parking (if applicable). POL vehicle parking shall be physically separated from organizational hardstand. POL parking shall be spaced a minimum of 10 feet between vehicles. POL parking area circulation lanes shall be 50 feet wide. Drainage from the POL parking area shall be isolated and shall not be allowed to enter underground storm or sanitary sewer systems without being impounded first and manually released. POL drainage impoundment shall be located 100 feet from any structure.
- (12) Dead Line Vehicle Parking. Dead Line Vehicle Parking spaces shall be sized based on the largest vehicle for the assigned maintenance bay. Parking spaces shall be spaced with side clearances of 3 feet and end clearances of 2 feet.
- (13) TEMF Aprons. TEMF aprons shall measure 45 feet wide on all four sides of the facility. Circulation lanes are not part of the 45-foot wide apron.
- (14) Site Storage Building Aprons. Site storage building aprons shall measure 27 feet wide along the entire building length on the vehicular access side. Circulation lanes are not part of the 27-foot wide apron.
- (15) Bollards at TEMF repair bays. Provide 12-inch diameter steel bollards filled with concrete at all TEMF repair bay openings where frequent vehicle access/egress increases the risk of damage by vehicle impact. Bollard footings shall be designed to withstand organizational vehicular impact.

(16) Mechanical and Electrical Equipment Yard. Provide 12-inch diameter by 5-foot high, concrete-filled, schedule 80 galvanized steel pipe bollards, 5 feet O.C. spacing, 5 feet from edge of the mechanical and Electrical Equipment Yard, painted safety yellow, around the perimeter of the equipment yards. Provide vehicular access and locate out of circulation areas. Bollard footings shall be designed to withstand organizational vehicular impact.

(17) Bollards at Out of Spec Waste Fuel, Used Oil and Used Engine Coolant (antifreeze) Storage Tank(s). Provide 12-inch diameter by 5-foot high, concrete-filled, schedule 80 galvanized steel pipe bollards, 5 feet O.C. spacing, 5 feet from edge of containment wall, painted safety yellow, around the perimeter of above-ground tank areas. Bollard footings shall be designed to withstand organizational vehicular impact.

(18) Bollards at Site Storage Buildings. Provide 12-inch diameter by 5-foot high, concrete-filled, schedule 80 galvanized steel pipe bollards, 5 feet O.C. spacing, 5 feet from the edge of the building. Bollard footings shall be designed to withstand organizational vehicular impact.

3.1.5. Architecture

(1) Exterior Materials. Select exterior materials to be attractive, economical, and durable and low maintenance. Masonry walls are preferred at the ground floor level.

(2) Floors. Provide concrete floors in maintenance and repair areas sloped in accordance with NFPA 30A and IBC/IPC. Provide a continuous trench drain located on the interior side of the overhead doors at repair areas and at centerline of central vehicle corridor, extending the length of maintenance areas.

(3) Natural Lighting. Repair and maintenance bays, storage and admin areas shall be illuminated using hybrid lighting systems which includes electric lighting with electronic daylight controls in combination with skylights with reflective tube that channels the light into the work area and a lens that diffuses the light, clerestory windows, and translucent wall panels above overhead doors. Open maintenance and storage sheds shall use hybrid lighting systems with a dome-shape skylights. Provide operable windows for natural lighting and ventilation in administration and shop control, training room, break/training/conference room, and consolidated bench repair shop. Preference will be given for designs providing vision panels in overhead doors.

(4) Partitions. Fixed walls are required to separate repair areas and maintenance areas from the core areas, along corridors, and surrounding fixed areas such as latrines, vaults, storage areas and shops. Shops and storage areas may be subdivided with metal mesh partitions. Admin., training and break room walls should be non-load bearing to the greatest extent possible (for example, gypsum board on steel studs) except around latrines.

(5) Sound Insulation. Provide sound insulation in all administration areas, training rooms, and bench repair areas to meet a minimum rating of STC 42 at walls and floor/ceiling assemblies, and a rating of STC 33 for doors. In addition to the sound insulation required, training areas shall meet a Noise Criteria (NC) 30 rating in accordance with ASHRAE Fundamentals Handbook.

(6) Repair Area Bay Doors. Provide overhead doors 24 feet wide by 14'-0" feet high in the exterior wall at each end of each structural bay. Provide doors of coiling, sectional, or telescoping design. Provide electrically operated doors with provision for manual chain operation. Provide manual 10-foot by 10-foot overhead doors for Consolidated Bench Repair Shop.

(a) Locking. Provide overhead doors that are operable from the interior only. Provide doors with a positive locking mechanism that will allow the door to remain open at engine exhaust position approximately 1 foot above the floor. Coordinate door locking requirements with the using service.

(b) Serviceability. Repair and maintenance bay doors shall be designed to meet heavy duty loads and high frequency of operation. Provide testing of deflection and operation of the doors prior to acceptance during construction. Doors shall be provided and installed by a commercial door company having not less than 5 years of experience in manufacturing, installing, and servicing the size and type of doors provided.

(c) Insulated Doors. Preference will be given to proposals that include insulated doors for thermal resistance and noise control.

(7) Personnel Doors. Provide exterior personnel doors in the ends of central vehicle corridor portion of maintenance areas and in the circulation bays as shown on the drawings. Provide steel doors with vision panels, except at storage, janitorial, and latrine areas. Minimum size for personnel doors is 3 feet wide by 7 feet high.

(8) Overhead Cranes. Crane shall be designed and constructed to CMAA 70 (Class C) or CMAA 74 (moderate requirements) for operation with hoist in accordance with ASME HST-1 or HST-4.

(a) The 10-ton crane shall have the following rated load speeds (plus or minus 15 percent):

1. Hoist - 20 fpm
2. Trolley - 65 fpm
3. Bridge - 125 fpm

(b) The 35-ton crane shall have the following rated load speeds (plus or minus 15 percent):

1. Hoist - 10 fpm
2. Trolley - 60 fpm
3. Bridge - 85 fpm

(c) Hoist motor control system shall provide one speed in each direction.

(d) Bridge and trolley main control systems shall provide one speed in each direction.

(e) Provide runway stops at limits of crane bridge travel.

3.1.6. Fire Protection

3.1.6.1. Standards and Codes

All fire protection and life safety features shall be in accordance with UFC 3-600-01 and the criteria referenced therein. Tactical Equipment Maintenance Facilities shall be classified as mission essential and shall be provided with complete sprinkler protection.

3.1.6.2. Fire Protection and Life Safety Analysis

A fire protection and life safety design analysis shall be provided for all buildings in the project. The analysis shall be submitted with the interim design submittal. The analysis shall include classification of occupancy (both per the IBC and NFPA 101); type of construction; height and area limitations (include calculations for allowable area increases); life safety provisions (exit travel distances, common path distances, dead end distances, exit unit width required and provided); building separation or exposure protection; specific compliance with NFPA codes and the IBC; requirements for fire-rated walls, doors, fire dampers, etc.; analysis of automatic suppression systems and protected areas; water supplies; smoke control systems; fire alarm system, including connection to the base-wide system; fire detection system; standpipe systems; fire extinguishers; interior finish ratings; and other pertinent fire protection data. The submittal shall include a life safety floor plan for all buildings in the project showing occupant loading, occupancy classifications and construction type, egress travel distances, exit capacities, areas with sprinkler protection, fire extinguisher locations, ratings of fire-resistive assemblies, and other data necessary to exhibit compliance with life safety code requirements.

3.1.6.3. Sprinkler System

Provide complete sprinkler protection for Vehicle Maintenance, UAV Maintenance and Storage Buildings, Organizational Storage Buildings, and Distribution Company Storage Buildings. Wet pipe sprinkler systems shall be provided in areas that are heated and dry pipe sprinkler systems shall be provided in areas subject to freezing. All floors and all areas of the facilities shall be protected. The sprinkler system design shall be in accordance with UFC 3-600-01 and NFPA 13. The sprinkler hazard classifications shall be in accordance with UFC 3-600-01, NFPA 13, and other applicable criteria. Design densities, design areas and exterior hose streams shall be in accordance with UFC 3-600-01. The sprinkler systems shall be designed and all piping sized with computer generated hydraulic calculations. The exterior hose stream demand shall be included in the hydraulic calculations. A complete sprinkler system design, including sprinklers, branch lines, floor mains and risers, shall be shown on the drawings. The sprinkler system plans shall include node and pipe identification used in the hydraulic calculations. All sprinkler system drains, including main drains, test drains, and auxiliary drains, shall be routed to a 2' x 2' splash block at exterior grade.

3.1.6.4. Sprinkler Service Main and Riser

The sprinkler service main shall be a dedicated line from the distribution main. Sprinkler service and domestic service shall not be combined. The sprinkler service main shall be provided with an exterior post indicator valve with tamper switch reporting to the fire alarm control panel (FACP). The ground floor entry penetration shall be sleeved per NFPA 13 requirements for seismic protection. The sprinkler entry riser shall include a double check backflow preventer, a fire department connection, and a wall hydrant for testing of backflow preventer. The

sprinkler system shall include an indicating control valve for each sprinkler system riser, a flow switch reporting to the FACP, and an exterior alarm bell. All control valves shall be OS&Y gate type and shall be provided with tamper switches connected to the FACP. Facilities with multiple floors shall be provided with floor control valves for each floor. The floor control valve assembly shall be in accordance with UFC 3-600-01, Figure 4-1.

3.1.6.5. Exterior Hose Stream

Exterior hose stream demand shall be in accordance with UFC 3-600-01. This shall be 250 gpm for light hazard and 500 gpm for ordinary hazard. Exterior hose stream demand shall be included in the sprinkler system hydraulic calculations.

3.1.6.6. Backflow Preventer

A double check backflow preventer shall be provided on the fire water main serving each building. This shall be located within the building. An exterior wall hydrant with dual hose connections with OS&Y valve shall be provided to allow testing of backflow preventer at design flow as required by NFPA 13.

3.1.6.7. Fire Department Connection

A fire department connection shall be provided for each building with sprinkler protection. These shall be located to be directly accessible to the fire department.

3.1.6.8. 3.1.6.4 Elevators

The fire protection features of elevators, hoist ways, machine rooms and lobbies shall be in accordance with UFC 3-600-01, ASME A17.1, NFPA 13 and NFPA 72.

3.1.6.9. System Components and Hardware

Materials for the sprinkler system, fire pump system, and hose standpipe system shall be in accordance with NFPA 13 and NFPA 20.

3.1.6.10. Protection of Piping Against Earthquake Damage

Sprinkler and fire pump piping systems shall be protected against damage from earthquakes. Seismic protection shall include flexible and rigid couplings, sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

3.1.6.11. Fire Water Supply

Fire flow test data is provided in Appendix D.

3.1.6.12. Fire Pump

Refer to paragraph 3.1.9, Electrical and Communication Systems, for requirements.

3.1.6.13. Fire Detection and Alarm

A fire alarm and detection system shall be provided for this facility. It shall comply with the requirements of UFC 3-600-01 and NFPA 72. The system shall be addressable and fully compatible with and integrated with the local base wide central monitoring system.

3.1.6.14. Building Construction

Construction shall comply with requirements of UFC 3-600-01, the International Building Code and NFPA 101.

3.1.6.15. Fire Extinguishers Cabinets and Brackets

Fire Extinguisher cabinets and brackets shall be provided when fire extinguishers are required by UFC 3-600-01 and NFPA 101. Placement of cabinets and brackets shall be in accordance with NFPA 10. Semi-recessed cabinets shall be provided in finished areas and brackets shall be provided in non-finished areas (such as utility rooms, storage rooms, shops, and vehicle bays). Fire extinguishers shall not be provided in this contract.

3.1.6.16. Interior Wall and Ceiling Finishes

Interior wall and ceiling finishes and movable partitions shall conform to the requirements of UFC 3-600-01 and NFPA 101.

3.1.7. Heating, Ventilation, and Air Conditioning (HVAC) Systems

(1) Ventilation System. Ventilation Supply system for the repair and maintenance bays and the vehicle corridor shall be designed to provide 100% of outdoor air with no recirculation and sized for minimum of 1.5 cfm per square foot per ASHRAE 62.1. Supply system's fan shall be equipped with a VFD and CO and NOX sensors to adjust supply airflow rate with a variable emission rate and use a pressure sensor to maintain positive pressure based on operation of a demand based local exhaust system. UAV Maintenance and Storage Building shall be designed to provide 100% of outdoor air with no recirculation and sized for minimum of 1.5 cfm per square foot per ASHRAE 62.1. For the Organizational Storage, Distribution Company Storage, POL Building, mechanical and electrical rooms, the ventilation rate shall be such that the space is maintained at a maximum of 10 degrees (F) above ambient conditions. Air supplied into the air conditioned core area shall be cascaded into adjacent areas for pressurization and to prevent polluted air from entering this area.

(2) System Selection.

(a) Repair and maintenance bays, the vehicle corridor, the UAV Maintenance and Storage Building and Distribution Company Storage Building are to be heated to 55 degrees F. Other site storage buildings (see paragraph 3.2.f) are to be heated to 40 degrees F for freeze protection.

(b) Occupied spaces within the core shall be heated and cooled in accordance with Paragraph 5 of Section 01 11 00. Consider all viable alternative systems meeting the functional requirements of each of the areas of the facility. For the core spaces, consider packaged equipment, split systems or systems utilizing chilled/heating water from either a central plant or decentralized sources.

(c) Return air plenum systems are not allowed for Tactical Equipment Maintenance Facilities.

(d) Consider use of evaporative air pre-cooling in hot climates.

(e) Telecommunications Rooms and SIPRNet rooms will each be served by an independent and dedicated air-handling system. Air handling unit system(s) shall not be floor-space mounted within the actual space served. Rooms shall be maintained at 72 degrees F and 50 percent relative humidity year-round. Assume 1775 BTU per hour for the equipment heat dissipation. Contractor shall verify this load during the design stage.

(3) Building Exhaust Systems. Provide general exhaust in repair and maintenance areas and exhaust systems at maintenance area pit, welding area and weapons vault. Welding function is portable but welding exhaust shall be a part of the building construction. Exhaust fan shall be non-sparking. Maintenance area pit exhaust system will be ducted exhaust system with explosion proof fans. Welding exhaust shall be manually engaged during the welding activity. All other exhaust systems will operate continuously while the building is occupied. Exhaust duct openings shall be located so that they effectively remove vapor accumulations at floor level from all parts of the floor area. Exhaust systems shall be in accordance with NFPA 30 and 30A. Energy recovery from exhaust air shall be used in climate zones 3 through 8.

(4) Vehicle Exhaust Evacuation Systems. Vehicle exhaust evacuation system for wheeled and tracked vehicles shall be provided at each repair area and along the vehicle corridor allowing for capturing exhaust fumes from stationary vehicles and vehicles moving in and out of the building and along the vehicle corridor. Consider viable alternative systems meeting the functional requirements of each of the areas of the facility. Size and locate the exhaust lines as required to service vehicles and equipment within the repair areas. Lines shall not interfere with maintenance operations or obstruct equipment such as the traveling bridge crane. 50% duty cycle of the total available capacity of vehicle exhaust can be considered unless specified otherwise by the using service. The using service is responsible for providing the transition connectors (if required, depending on the type of exhaust system provided) between the vehicle exhaust and the vehicle exhaust system installed in the building. All system components must be compatible with the vehicle exhaust temperatures. Unless otherwise indicated by the user, design exhaust outlets for 1400 cfm and 700 degrees F. Exhaust evacuation systems in repair bays intended for repair of tracked vehicles shall be designed to withstand at least 1250 degrees F and shall have two exhaust

outlets evacuating 1400 cfm each which can be connected to tracked vehicle's exhaust grills. Ventilation in the maintenance and repair bays shall be as a minimum per ASHRAE 62.1. Additional makeup air may be needed compensate for the exhaust requirements.

(5) HVAC Controls. HVAC Controls shall be in accordance with paragraph 5.8.3. See Appendix for HVAC Controls for typical control system points schedules. These schedules identify as a minimum points to be monitored and controlled by the building automation system (BAS). See paragraph 6 for any additional installation specific points. Points schedule drawings convey a great deal of information critical to design, installation, and subsequent performance of the control system. It includes hardware input/output information, device ranges and settings, ANSI 709.1 communications protocol data, and information about data that is to be used at the operator workstation by Monitoring and Control software. These schedules are available as an excel spread sheet and as AutoCAD drawings on Engineering Knowledge Online (EKO) website <https://eko.usace.army.mil/fa/bas/>. Point schedule of system types not addressed in the appendix shall be developed by the Contractor, and shall be sufficiently detailed to a level consistent to a similar listed system in the appendix. It is recommended that all of the guidance and instruction documents be reviewed prior to using any of the info, as the documents provide necessary and critical information to the use of website drawings and other information.

3.1.8. Plumbing

(1) Trench Drains. Design trench drain for easy cleaning. Provide basket strainers to facilitate trash removal where trench drains discharge to piping systems. Convey waste to exterior oil/water separator prior to discharge to the sanitary sewer system. When a dedicated, partitioned welding area is provided, provide a solid cover to the trench drain where it runs through the welding area.

(2) Emergency Showers and Eye Washes. See Section 3.1.1 (3) (b) for eye wash, hand held drench hose and emergency shower requirements within the repair and maintenance areas and core area.

(3) Compressed Air. Provide the compressed air outlets with quick disconnect couplings in all repair and maintenance areas, along the vehicle corridor, at two places in the pit, and in the Consolidated Bench Repair area. Provide one compressed air outlet per bench in Consolidated Bench Repair area. Each drop shall include an isolation valve, filter and pressure regulator, condensate trap with drain cock. Provide air compressor with receiver, refrigerated air dryer, filtration and pressure regulation. The air compressor shall be installed building equipment. Size air compressor for 10 CFM per outlet in repair and maintenance areas and 5 cfm per outlet in the Consolidated Bench Repair area, with a 60 percent diversity (assume 60% of all drops in the facility will be in use at the same time), plus any additional compressed-air equipment in the facility. Unless otherwise indicated by the user requirements in paragraph 6, provide compressed air at 120 psi.

(4) Sump Pump. Provide sump pump in maintenance pit and elevator pit. Determine if maintenance pit sump pump shall be explosion proof type and provide explosion type, if required. Sump pump shall be submersible type and shall be capable of handling small amounts of oil and anti-freeze. Maintenance pit and elevator pit sumps shall discharge to an oil water separator.

3.1.9. Electrical and Telecommunications Systems

See Paragraph 6 for work to be performed by others (work indicated in paragraph 3 shall be a part of this contract unless otherwise indicated in paragraph 6), clarifications and additional requirements for the electric and telecommunications systems.

(1) Exterior Electrical Distribution System

(a) Parking Pad and Power Connections. Provide power connections to hardstand for existing equipment as required in Features Matrix.

(2) Exterior Lighting

(a) Exterior Lighting General. Exterior lighting systems inside the TEMF security fence shall be provided for sidewalks, roadways, service yards, facility aprons, open storage areas and parking areas. Exterior lighting shall consist of high intensity discharge (HID) light fixtures, mounted on poles located within the AT/FP fence line clear zone and elsewhere as required to attain illumination levels and uniformity. Poles located within the service yards, facility aprons and hardstand parking areas shall be located and protected to minimize damage from vehicles. Building-mounted light fixtures may be used around the building perimeter to supplement pole mounted light fixtures. Building mounted light fixtures used solely for building perimeter and doorway lighting may be fluorescent. Illumination levels shall be 5 foot-candles for areas adjacent to the primary facility and no less than 0.5 foot-candles

for parking areas. Exterior lighting shall be controlled by a photosensor or astronomical time clock that is capable of automatically turning off the exterior lighting when sufficient daylight is available or the lighting is not required.

(b) Perimeter Security Lighting. Protective lighting systems shall be provided in response to project specific requirements to deter trespassers and make them visible to guards. Levels of exterior lighting for protected areas shall conform to the requirements in the IESNA Lighting Handbook. Lighting circuits shall be controlled by a photosensor with manual override.

(3) Exterior Communication Services

(a) Parking Pad and Data Connections. None required

(4) Interior Electrical and Telecommunications

(a) Electrical

i. Power Service. In the electrical equipment room provide a space for 3-phase, 200 ampere breaker with additional 3-phase, 200 ampere power capacity for this breaker in the main switch board. Installation shall conform to NFPA 70, National Electrical Code.

ii. Nonlinear Loads. The effect of nonlinear loads such as computers and other electronic devices shall be considered and accommodated as necessary. These loads generate harmonics, which can overload conventionally sized conductors or equipment and thereby cause safety hazards and premature failures. Circuits serving such devices shall be equipped with a separate neutral conductor not shared with other circuits. Panelboards and any dry type transformers shall be rated accordingly.

iii. Lightning Protection System and Transient Voltage Surge Protection. Design shall be in accordance with NFPA 780 and other referenced criteria. Provide transient voltage surge protection.

(b) Receptacles. Power receptacles shall be provided per NFPA 70 and in conjunction with the proposed equipment and furniture layouts. Provide power connectivity to each workstation. Provide a duplex receptacle adjacent to each duplex voice/data and CATV outlet.

(c) Special Power Requirements. Electrical power outlets for special power shall be coordinated with workbench locations in shops and provided in the maintenance areas. Both low voltage and high frequency power may be required in some areas. See the TEMF Features Matrix. Coordinate with the User for the electrical characteristics of the equipment to be provided by the Government.

(d) Hazardous Locations. Hazardous locations shall be clearly defined on the drawings by the designer based on the intended use of the facility and applicable criteria. Receptacles, devices, equipment and wiring in hazardous locations shall be designed (UL listed for the application) and installed in accordance with the NFPA codes. When hazardous locations are determined to be up to 18 inches above the finished floor, receptacles and devices and conduit routing to them shall be installed above the hazardous area, where possible.

(e) Lighting. Lighting and lighting controls shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA) and the requirements of ASHRAE 90.1.

i. Office, Training Room and Conference Room Lighting. Interior ambient illumination shall provide a generally glare free, high quality lighting environment conforming to IESNA RP-1-04. Training rooms and conference rooms shall have a dimmable circuit providing general lighting without glare on audio-video displays. Dimming ballasts shall be capable of dimming to 5 percent.

ii. Repair and Maintenance Areas. Illumination of the repair maintenance areas shall consist of T5, T5HO or T8 fluorescent light fixtures. The fixture layout shall be coordinated with the traveling bridge crane requirements.

iii. Maintenance Pit Lighting. Illumination in maintenance pits shall consist of T5, T5HO or T8 fluorescent linear light fixtures mounted in the pit area for general illumination. Task illumination shall be provided by no fewer than four pit-mounted incandescent, compact fluorescent or metal halide adjustable, swing-arm task lights. In lieu of swing-arm task lights, no fewer than two receptacles with cord and plug incandescent, compact fluorescent or metal halide portable safety lights may be provided. Each cord shall be of adequate length to service no less than 60 percent of the pit area. All equipment shall be suitable for the hazardous classification of the pit.

iv. Illumination Levels. Maintained Illumination levels shall be in accordance with the Table 4 below. Maintained illumination levels in areas not included in Table 4 shall comply with the recommendations of the IESNA Lighting Handbook. Illumination levels in maintenance pits shall be calculated based on no contribution from the overhead ambient light fixtures.

TABLE 4 ILLUMINATION LEVELS	
FUNCTIONAL AREA	FOOT CANDLES
Administration and Shop Control	50
Warehouse, Storage, and Miscellaneous Rooms	20
Latrines, Showers, and Lockers	20
Break, Training, and Conference	30
Repair and Maintenance Areas	50
Weapons Storage and COMSEC Vaults	50
Maintenance Pit	15
Repair Shops (General Item, Compact Item, Special Environment, Battery, etc.)	50
Electrical/Mechanical Rooms	30

(f) Telecommunications System including Telecommunications and SIPRNET Minimum Room Sizes - Telecommunication Pathways, Outlets and Cabling. Telecommunications cabling shall be Category 6 for all voice and data connections unless length of run warrants need for multimode fiber optic cable. Provide number and type of connectors as defined by the User. Telecommunications outlets and conduits shall be provided in core areas and supply administration areas with a minimum of one outlet in each work area. Each Training Room shall have a voice outlet. Each Training Room shall have a data connection for each seat and for an instructor. Each repair area workstation shall have access to a data connection. In administration and shop control areas provide a voice and data outlet for every workstation. A data outlet shall be provided at each copier location. Provide a single jack outlet for wall mounted GFGI phones in mechanical, electrical, vaults, telecommunications room and corridors. For controlled access facilities, provide outlets for wall mounted GFGI phones at primary entrance. Additional outlet locations may be provided based on coordination with the facility User and where required for HVAC equipment or other equipment. Provide outlets per I3A technical criteria and Table 5 below. Provide Telecommunications and SIPRNET rooms minimum sizes as indicated in Table 5A below.

TABLE 5 OUTLET DENSITIES	
FUNCTIONAL AREA	AREA PER OUTLET (SF)
Administration and Shop Control	80
Latrines, Showers, and Lockers	0
Break, Training, and Conference	80
Repair and Maintenance Areas	500
Weapons Storage and COMSEC Vaults	80
Repair Shops (Consolidated bench repair, Battery, etc)	80

TABLE 5A - Minimum Size Telecommunications and SIPRNET Rooms for TEMF				
TEMF	Telecommunications Room		SIPRNET Room	
Floor	Width Feet (min)	Square Feet (min)	Width Feet (min)	Length Feet (min)
1st Small	8	150	6	6
1st Medium	8	150	6	6
2nd Medium	8	110	None	None
1st Large	8	150	6	6
2nd Large	8	110	None	None
1st EXLarge	8	150	6	6
2nd EXLarge	8	150	None	None
General Notes: 1. Width is a minimum inside edge of wall to inside edge of wall dimension inside the room. Length shall be greater than or equal to width. 2. The Telecomm room shall not be less than the minimum width and square feet indicated above and the SIPRNET rooms shall not be less than the minimum width not be less than the minimum width and length indicated above. Telecommunications and SIPRNET rooms shall be rectangular in shape.				

(g) Cable Television (CATV). A minimum of two CATV outlets shall be provided in the Break, Training, and Conference Room and Admin and Shop Control Room. The cable television system shall consist of cabling, pathways and outlets. All building CATV systems shall conform to applicable criteria to include I3A Technical Criteria and the UFC 3-580-01 Telecommunications Building Cabling Systems Planning Design.

(h) Audio/Visual Systems

i. Audio/Visual Systems. Provisions (consisting of a power receptacle and conduit for signal wiring) for a GFGI projector shall be provided in each Training Room.

ii. Paging Systems. A paging system shall be provided for the repair areas and maintenance areas with the microphone located in the administration and shop control area. The system shall be zoned for multiple bay operation and shall have input from the telephone system.

(i) Security Infrastructure. The security infrastructure shall be installed to support GFGI equipment including cameras, door alarms, and motion sensors.

i. Intrusion Detection and Security Systems. Provision for user provided ICIDS intrusion detection and security systems are required for secure and restricted areas including the arms vault, COMSEC vault and SIPRNet room. Provisions shall include dedicated power circuits, telecommunications connections, and raceways and signal wiring for user installed devices. System requirements shall be coordinated with the Installation Security Office.

ii. Access Control System. The access control system shall consist of proximity sensors throughout the facility with varying levels of security. System requirements shall be coordinated with the Installation Security Office.

(j) Mass Notification System (MNS). A mass notification system shall be provided as required by UFC 4-010-01.

(k) Grounding. Each maintenance building shall have a ground grid around the building perimeter for grounding incoming service, building steel, lightning protection, telephone service, piping, and internal grounding requirements. Ground busbar shall be provided on walls of each repair area. A grounding point shall be provided in each repair area and each maintenance area. Each repair area and maintenance area is 16' x 32' in size. Grounding points shall be provided in vehicle and equipment parking areas on 40-foot centers (maximum) and coordinated parking layout. It will be acceptable to provide a minimum of one grounding point for every eight vehicles parked in a double row, and one grounding point for every four vehicles parked in a single row configuration. Install an interior #2 AWG bare tinned copper ground loop around the perimeter of the Fluid Distribution Room for dissipation of potential static charge. Bond ground loop to building structure and grounding riser. Provide thirty (30) #6 AWG bare copper pigtailed complete with alligator clips on both ends for grounding of metallic barrels/dispensing equipment. Length of pigtailed should be based on potential layout of equipment/drums and the location of ground ring. Additional grounding may be provided based on project requirements. Systems

shall conform to NFPA 70 National Electrical Code, NFPA 780 Standard for the Installation of Lightning Protection Systems, local codes and the Technical Guide for Installation Information Infrastructure Architecture (I3A).

(l) **SIPRNET.** The SIPRNET room shall be designed and constructed in accordance with the “Building SIPRNET Communication Room – New Construction Guidance”, paragraph of the Technical Guide for Integration of SIPRNET (Secret Internet Protocol Router Network). The SIPRNET room design and construction shall be coordinated with local DOIM and Physical Security Office. SIPRNET conduit and cable to SIPRNET Drops and the SIPRNET Drops will be provided in the future and is not to be provided as part of this scope of work. Connection to the main telecommunications room from the SIPRNET room shall be via a 2-inch trade size steel conduit. Provide six strands of single mode fiber optic cable from Telecommunications Room to the SIPRNET Room. Provide a communications signal ground bus bar connected to the main communications room signal bus bar via a properly sized ground wire (see MIL-HDBK-419-A, which is referenced in the Technical Guide for the Integration of SIPRNET). Provide one dedicated standard 20-amp duplex receptacle for future SIPRNET rack in addition to convenience receptacles in the SIPRNET room.

(m) **Hydraulic Lift.** In each pair of repair areas, provide electric power for User provided (GFGI) portable hydraulic lift. Coordinate electrical requirements with the User.

(n) **Fire Detection and Alarm**

i. A fire alarm and detection system shall be provided for this facility. It shall comply with the requirements of UFC 3-600-01 and NFPA 72. The system shall be addressable and fully compatible with and integrated with the local installation wide central monitoring system. Coordinate fire alarm system requirements with the Fire Department’s Representative during design.

ii. All initiating devices shall be connected, Class A, Style 6, to signal line circuits (SLC). All alarm appliances shall be connected to notification appliance circuits (NAC), Class A. A looped conduit system shall be provided so that if the conduit and all conductors within are severed at any point, all NAC and SLC shall remain functional.

iii. Breakglass manual fire alarm stations shall not be used.

iv. Over-voltage and surge protection shall be provided at the input power of all panels.

3.1.10. COMPLIANCE WITH THE ENERGY POLICY ACT OF 2005 (EPACT 2005)

(1) **EPACT 2005 REQUIREMENT.** The building, including the building envelope, HVAC, ventilation and exhaust systems, service water heating, power, and lighting systems shall be designed to achieve an energy consumption that is at least 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004 (see paragraph 5.9 Energy Conservation)

(2) **TARGET ENERGY CONSUMPTION BUDGET.** The target energy consumption budget (excluding plug loads) for this facility located in DOE Climate Zone 3B is 33 kBtu per ft² per year or less. The use of the Prescriptive Technology Solution Set, shown below, will result in an annual energy consumption less than or equal to the target energy budget figure.

(3) **EPACT Methodology.** See below for two paths (Prescriptive and Compliance) for demonstrating compliance with EPACT.

(a) **Prescriptive path (use of technology solution set).** The technology solution set shown in the table below, in combination with mandatory requirements for all TEMF stated in paragraph 3.1, including daylighting, demand controlled ventilation systems and robust vehicle exhaust evacuation systems, achieves the above energy performance and life cycle cost effectiveness requirements for a TEMF facility in the indicated DOE climatic zone. The use of the prescriptive technology solution set is optional. The contractor may elect to develop his own unique solution as described under the Compliance Path.

Climate Zone 3B, Prescriptive Technology Solution Table

Item	Component	Baseline ¹	Improvement
Roof	Insulation above deck	R-15 ci	
	Metal building roof		R-13 + R-13
	Surface reflectance	0.3	0.65
Walls	Steel-framed	R-13	
	Metal building		R-13
Slabs	Unheated	NR ²	NR

	Heated	R-7.5 for 12 in	R-10
Doors	Swinging	U-0.70	U-0.70
	Non-Swinging	U-1.45	U-0.25
Infiltration		0.5 ACH	0.5 ACH
Vertical Glazing	Window to Wall Ratio (WWR)	< 10%	< 10%
	Thermal transmittance	U-0.57	U-0.45
	Solar heat gain coefficient (SHGC)	0.37	0.44 – N; 0.31 – S, E, W
	South Overhangs	None	NR
Skylights	Percent roof area	None	2%
	Thermal transmittance		U-0.69
	SHGC		0.19
Interior Lighting	Lighting Power Density	See Note 3	See Note 3
	Ballast		Electronic ballast
	Daylighting controls ⁴	none	Yes
	Occupancy controls	NR	all unoccupied spaces
HVAC	Make up Air Unit Fans	See Fan Efficiency Table	See Fan Efficiency Table
	Air Conditioner	PSZ-AC 12.0 SEER	PSZ-AC 14.0 SEER
	Gas Coil	80% E _t	90% E _t
	Hydronic radiant floor heat	None	Ground floor
	ERV	None	Yes
Economizer		NR	NR
Ventilation	Outdoor Air Damper	Motorized control	Motorized control
	Demand Control	NR	YES
	Transpired Solar Coll.	None	Yes
Ducts	Sealing		Seal class B
	Location		Interior only
	Insulation level ⁵		R-6
Service Water Heating	Gas storage	80% E _t	90% E _t

1. Baseline requirements are from ANSI/ASHRAE/IESNA Standard 90.1-2004.
2. NR means there is no requirement or recommendation for a component in this climate.
3. Lighting power densities in accordance with the following table:

Zone	Baseline	Recommendation
Repair Bay	1.7 W/ft ² (18.3 W/m ²)	1.3 W/ft ² (14.0 W/m ²)
Vehicle Corridor	0.7 W/ft ² (7.5 W/m ²)	0.7 W/ft ² (7.5 W/m ²)
Showers	0.6 W/ft ² (6.5 W/m ²)	0.6 W/ft ² (6.5 W/m ²)
Storage 1	0.9 W/ft ² (9.7 W/m ²)	0.9 W/ft ² (9.7 W/m ²)
Consolidated Bench	1.9 W/ft ² (20.5 W/m ²)	1.3 W/ft ² (14.0 W/m ²)
Storage 2	0.9 W/ft ² (9.7 W/m ²)	0.9 W/ft ² (9.7 W/m ²)

Zone	Baseline	Recommendation
Office	1.0 W/ft ² (10.8 W/m ²)	0.9 W/ft ² (9.7 W/m ²)

4. Daylighting should be included in the repair bays, vehicle corridor, and office.
5. The duct and pipe insulation values are from the ASHRAE Advanced Energy Design Guide for Small Offices.

Fan Efficiencies

System	Baseline Efficiency		Improved Efficiency	
	Fan Motor	Total Fan	Fan Motor	Total Fan
Repair Bay	0.80	0.27	0.90	0.45
Vehicle Corridor	0.80	0.19	0.90	0.45
Showers	0.80	0.20	0.85	0.34
Storage 1	0.80	0.20	0.85	0.34
Consolidated Bench	0.80	0.19	0.90	0.45
Storage 2	0.80	0.20	0.85	0.34
Office	0.80	0.20	0.85	0.34
Fan Coil Units	0.80	0.30	0.85	0.34

(b) Compliance path (unique design solution). When the "Compliance Path" is selected, the facility design shall include a uniquely developed technology solution set which can be shown by the design analysis (using facility energy simulation software) not to exceed the target energy consumption budget stated in Paragraph 3.1.10 (2) above and meet all the criteria in the DOE interim final rule: "Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings"

(4) Schedules. If a unique technology solution set method of compliance is chosen then the following load schedules must be used in all facility energy simulations for purposes of showing compliance with Paragraph 3.1.10 (3) b. The plug loads in the following schedules shall be included in the energy simulation program but shall be manually subtracted from the calculations to compare the calculated budget to the target energy consumption budget in paragraph 3.1.10 (2). Additionally, for simulation of a baseline building model, the "baseline values" for each component shown in the "Prescriptive Technology Solution Table" shall be used.

Hr	Occupancy			Lighting			Plug Loads			Service Hot Water		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
2	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
3	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
4	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
5	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
6	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
7	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
8	0.15	0	0	0.4	0.04	0.04	0.5	0.2	0.2	0.1	0.03	0.03
9	0.7	0	0	0.9	0.04	0.04	0.8	0.2	0.2	0.7	0.03	0.03
10	0.9	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
11	0.9	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
12	0.9	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
13	0.5	0	0	0.8	0.04	0.04	0.8	0.2	0.2	0.7	0.03	0.03

Hr	Occupancy			Lighting			Plug Loads			Service Hot Water		
14	0.85	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
15	0.85	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
16	0.85	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.7	0.03	0.03
17	0.2	0	0	0.9	0.04	0.04	0.9	0.2	0.2	0.2	0.03	0.03
18	0	0	0	0.3	0.04	0.04	0.4	0.2	0.2	0.03	0.03	0.03
19	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
20	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
21	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
22	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
23	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03
24	0	0	0	0.04	0.04	0.04	0.2	0.2	0.2	0.03	0.03	0.03

3.1.11. Equipment and Furniture:

(a) Equipment and furniture are necessary to make TEMF ready for daily operations. Some items are provided as integral parts of the building construction. Most furniture and equipment must be provided by others. Table 6 shows typical contract provided equipment that is needed to make TEMF ready for operations.

TABLE 6 INSTALLED BUILDING EQUIPMENT		
Area	Equipment Class ¹	Equipment/Furniture Item
Repair Areas	CFCI	Exhaust System (See para. 5)
	CFCI	Bridge Crane (See para. 5)
	CFCI	Compressed Air (See para 5)
Maintenance Areas	CFCI	Bridge Crane (See para. 5)
	CFCI	Maintenance Pit
	CFCI	Compressed Air (See para 5)
	CFCI	Dispensing/Disposal System
	CFCI	Emergency Eye Wash, hand wash and shower station
Administration and Shop Control	CFCI	Fire Extinguisher Cabinets
	CFCI	Window/Reception Counter
Consolidated Bench	CFCI	Fire Extinguisher Cabinets
Tool Room	CFCI	Compressed Air (See Para. 5)
Tool Box Storage	CFCI	Window/Reception Counter
Combat Spares	CFCI	Window/Reception Counter
Latrines, Showers & Lockers	CFCI	Window/Reception Counter
Break, Training, Conference Room	CFCI	Lockers and Benches
Weapons & COMSEC Vaults	CFCI	Counter with Sink
		Vault Door

TABLE 6 INSTALLED BUILDING EQUIPMENT		
Area	Equipment Class ¹	Equipment/Furniture Item
Site	CFCI	Oil/Water Separator

Note (1): CFCI is Contractor Furnished/Contractor Installed equipment. This equipment is always MCA funded and is part of the construction contract.

(b) Furniture Systems. The following criterion describes the furnishing requirements for all room types. Furnishings, other than installed building equipment, are to be Government-furnished and Government-installed (GFGI) unless otherwise specified in this document. The following furnishings table is provided for coordination of room and office layouts to ensure suitability for their intended function.

Table 7: Room Size and Furnishings Chart

Table 7- Room Size and Furnishings Chart				
Room	Description	NSF	Comments	Furniture Required
Admin & Shop Control	Administration & Shop Control	Varies	OPEN-PLAN OFFICE	Systems furniture open plan office area with workstations, approx. 64 SF, with work surfaces, file drawers and overhead storage each for six staff members in Small TEMF, 16 staff members in Medium TEMF, 40 staff members in Large TEMF, and 57 staff members in Extra Large TEMF. Records section to have min. of 1 LF of 4 –drawer horizontal file cabinet for every 4 SF of room (250 SF room = min. 62.5 LF 4-drawer horizontal base files).
TRAINING ROOM	Training Room	1080	CLASSROOM	1 desk and chair for each 20 SF to accommodate min. 30 students.
BREAK ROOM/ CONF/ TRAIN	Break Room/ with adjacent Multi-purpose Space	Varies	STAFF BREAK AREA & CONFERENCE ROOM	Min. 10 LF base and wall cabinets with space for commercial grade refrigerator with ice maker. Provide seating and tables to accommodate approx. 40 percent of the building occupants.
ARMS VAULT	Class 5A Vault	300	CONSTRUCTED IN ACCORDANCE WITH AR 190-11, APP G.	1 desk to accommodate a computer, 1 task chair, 1 bookcase for manuals, one 4-drawer file cabinet, and 1 work bench.
COMSEC VAULT	Class 5V Vault	300	CONSTRUCTED IN ACCORDANCE WITH AR 380-5.	1 desk to accommodate a computer, 1 task chair, 1 bookcase for manuals, 4 lockable metal cabinets with shelves, two 4-drawer file cabinets, industrial shelving approximately 10'wx4'dx6'h each.
COMBAT SPARES	Spare Parts	Varies	STORAGE ROOM	1 desk to accommodate a computer, 1 task chair, one 4-drawer file cabinet, and 4 lockable metal cabinets with shelves.
TOOL ROOM	Tools and Tool Set Storage	Varies	STORAGE ROOM	1 desk to accommodate a computer, 1 task chair, one 4-drawer file cabinet, and 4 lockable metal cabinets with shelves.

Table 7- Room Size and Furnishings Chart

Room	Description	NSF	Comments	Furniture Required
SECURE STOR.	Secure Storage	300	CONSTRUCTED IN ACCORDANCE WITH RISK LEVEL II ANALYSIS OF AR 190-51.	4 lockable metal cabinets with shelves and industrial shelving approximately 10'wx2'dx6'h each - 1 for small TEMF, 2 for medium, 3 for large, and 4 for extra large.
CONSOLD. BENCH REPAIR	Consolidated Bench Repair	Varies	WORK AREA	Min. 16 LF of 8'wx34"dx36"h work benches per each assigned repair technician – 6 for small TEMF, 20 for Medium, 36 for Large, and 71 for Extra Large.

3.2. FUNCTIONAL AND OPERATIONAL REQUIREMENTS

(a) Not Used

(b) Medium TEMF. The nominal square footage (NSF) shown for each space below is used for programming purposes, and as a basis for computing the maximum allowable gross area of the facility. The floor plan provided should be used for building layout.

MEDIUM TEMF				
CORE ANALYSIS BY FUNCTIONAL AREA	NUMBER OF PERSONNEL			NSF
Administration & Shop Control	16			2,100
Training Room	0			1,080
Consolidated Bench	20			2,100
Combat Spares	0			500
Tool Room	0			500
Tool Box Storage	0			300
Latrine	0			2,700
Break, Training & Conference	0			600
Weapons Vault	0			300
COMSEC Vault	0			300
Secure Storage	0			300
Telecommunications Room (NIPRNet)	0			150
Telecommunications Room (SIPRNet)	0			150
Core Area (NSF)	36			11,080
REPAIR AREA ANALYSIS BY FUNCTIONAL AREA	NUMBER OF PERSONNEL	NUMBER OF CIRCULATION AREAS	WORK AREAS (512 NSF)	NSF
Repair Areas	40		14	7,168
Maintenance Areas			16	8,192
Welding Area			2	1,024
Total Work Areas			32	16,384
Circulation Area		1		768
Total Repair Area (NSF)	40	1	32	17,152

SHOP TOTAL	NUMBER OF PERSONNEL	NUMBER OF CIRCULATION AREAS	WORK AREAS (512 NSF)	NSF
Non-Assignable & Utilities Factor				1.25
SHOP TOTAL (GSF)	76	1	32	35,290
FLOOR PLAN AREA SHOWN				35,290

- (c) Not Used
- (d) Not Used
- (e) Architectural TEMF Features Matrix

ARCHITECTURAL TEMF FEATURES MATRIX																													
	COLUMN-FREE SPACE	WIRE MESH ENCLOSURE	STUDWALL PARTITIONS	CONC/CMU IMPACT RESISTANT PARTITIONS	GYPSBOARD IMPACT RESISTANT PARTITIONS	WINDOWS TO REPAIR BAYS	WINDOWS TO EXTERIOR	VINYL COMPOSITION TILE	CONCRETE FLOOR HARDENER	CERAMIC TILE FLOOR	PAINTED WALLS	WALL CORNER GUARDS	FINISHED CEILING	MOISTURE RESISTANTCEILING	EXPOSED STRUCTURE OVERHEAD	CEILING HEIGHT 9 FT.	CEILING HEIGHT 12 FT.	10 TON CRANE-HOOK HEIGHT 20 FT. (Note 4)	35 TON CRANE-HOOK HEIGHT 25 FT. (Note 4)	OPERABLE WINDOW FOR TESTING SIGHTS	LOCKERS	OVERHEAD COILING DOORS - 10 FT. X 10 FT.	OVERHEAD COILING DOORS - 24 FT. X 14 FT.-0 IN.	BOLLARDS @ OH DOORS INSIDE/OUTSIDE	GSA CLASS 5 VAULT DOOR	MAINTENANCE PIT	ISSUE WINDOW WITH COUNTER & COILING DOOR	BUILT-IN STORAGE BINS	
FUNCTIONAL AREAS																													
ADMIN & SHOP CONTROL			1			•	•	•			•	•	•			•													
TOOL ROOM		3			•				•		•	•	•				•											•	•
TOOL BOX STORAGE		3			•				•		•	•	•				•											•	•
COMBAT SPARES		2			•				•		•	•	•				•										•	•	
LATRINES, SHOWERS, LOCKERS					•					•	•	•	•	•		•					•								
TRAINING ROOM			•				•	•			•	•	•			•													
BREAK, TRAINING & CONF			•				•	•			•	•	•			•													
CONSOLIDATED BENCH REPAIR				•					•		•	•	•	•			•	•		•	•			•					
WEAPONS STORAGE VAULT		2		•					•		•	•	•			6	•									•			
COMSEC VAULT		2		•					•		•	•	•			6	•								•				
NONSENSITIVE SECURE STORAGE				•					•		•	•				•	•												
COMMUNICATION VEHICLE DOCK																													
CORRIDOR				•				5			•	•	•	•			•												
MECHANICAL ROOM				•					•		•	•	•				•												
ELECTRICAL ROOM				•					•		•	•	•				•												
COMMUNICATIONS ROOM					•				•		•	•	•				•												
SIPRNet ROOM									•		•	•	•				•												
FLUID DISTRIBUTION									•		•	•	•			•						•		•		•			
REPAIR AREAS	•								•		•					•			•	•				•	•				
MAINTENANCE AREAS	•								•		•				8			•	•					•	•		•		
HARDSTAND																													
ORG STORAGE	•	•							•		•					•						•							
UAV MAINT. AND STORAGE BUILDING	•										•													•					
DISTRIBUTION COMPANY SUPPLY BLDG		•	•						•		•	•				•						•							
HAZ WASTE & POL STORAGE BUILDINGS	•	•							•		•					•						•							

Notes for Architectural TEMF Features Matrix

1. Lightweight, non-bearing partitions removable to rearrange space
2. Wire mesh partitions to subdivide where required
3. Wire mesh enclosed for tool storage to facilitate interaction of mechanics and tool room keeper, and for relocation flexibility.
4. Provide a top running, 35-ton, bridge crane for one wing of repair areas and maintenance areas as noted in para. 2.1.
5. VCT in corridor on 2nd Floor (except Small TEMF).

6. Concrete roof caps are required for both COMSEC and Arms Vaults; a secondary ceiling may be provided in these areas as noted. Vault caps shall not be left exposed to view from adjacent spaces. Tops of vault caps must be rendered as lockable access only (i.e. accessibility to mechanical ductwork or in-line fans).
 7. All Finishes are considered minimum finishes only.
 8. The Maintenance Corridor through the Core Area shall have a minimum 14'-0" clear Ceiling Height.
- (f) Mechanical TEMF Features Matrix

MECHANICAL TEMF FEATURES MATRIX	HVAC	HEAT	VENTILATE	AIR CONDITION	VEHICLE EMISSIONS EXHAUST SYSTEM	PLUMBING & FIRE PROTECTION	LAVATORY OR SINK	HOSE BIBB	WASH FOUNTAIN	WATER CLOSET	URINAL	SHOWERS	COMPRESSED AIR	EMERGENCY SHOWER & EYEWASH	SPRINKLER SYSTEM	TRENCH DRAIN AT DOORS	FLOOR DRAIN	MISCELLANEOUS	STEAM CLEANING FOR PARTS/ENGINES	WELDING AND/OR MACHINIST AREA	POL DISPENSING HOSE WITH REEL SYSTEM	ENVIRONMENTAL	OUT OF SPEC WASTE FUEL STORAGE	WASTE OIL STORAGE	WASTE ANTIFREEZE STORAGE/RECYCLE
FUNCTIONAL AREAS																									
ADMIN & SHOP CONTROL		•		•											•										
TOOL ROOM		•		•											•										
TOOL BOX STORAGE		•		•											•										
COMBAT SPARES		•		•											•										
LATRINES, SHOWERS, LOCKERS		•	•	•			•	•	8	•	•	•			•		•								
TRAINING ROOM		•		•											•										
BREAK, TRAINING & CONF		•		•			•								•										
CONSOLIDATED BENCH REPAIR		•		•									•	•	•		7								
WEAPONS STORAGE VAULT		•		•											•										
COMSEC VAULT		•		•											•										
NONSENSITIVE SECURE STORAGE		•	•												•										
COMMUNICATION VEHICLE DOCK																									
CORRIDOR		•		•											•										
MECHANICAL ROOM		4	•				•								•		•								
ELECTRICAL ROOM		4	•												•										
COMMUNICATIONS ROOM				•											•										
SIPRNet ROOM				•											•										
FLUID DISTRIBUTION		•	•				•					•	•	•	•										
REPAIR AREAS		•	•	•			•	8				•	•	•	•	•	7	5	1				3	3	3
MAINTENANCE AREAS		•	•	6			•					•	•	•	•	•	7			•			3	3	3
HARDSTAND																									
ORG STORAGE		4	•												•										
UAV MAINT. AND STORAGE BUILDING		•	•												•										
HAZ WASTE & POL STORAGE BUILDINGS				•																					
DISTRIBUTION COMPANY STORAGE FACILITY		•	•												•										

Notes for Mechanical TEMF Features Matrix

1. Welding exhaust system in one pair of repair areas. This area will also accommodate machinist function.
2. Not Used
3. Provide secondary containment in tanks outside of building.
4. Heat for freeze protection only.
5. Provide water and power connections for hook-up of user procured (GFGI) portable steam cleaner for cleaning of engines and engine components in a pair of repair areas.
6. Provide non-sparking explosion proof exhaust from pit.
7. Convey waste water through an oil/water separator prior to discharge to sanitary sewer.
8. Provide wash fountain in 8 FT circulation bay adjacent to the core area, or outside the latrines in the core area as shown on the drawings.

(g) Electrical TEMF Features Matrix

ELECTRICAL/ TELECOMMUNICATIONS TEMF FEATURES MATRIX																		
	POWER	28V DC	120V SINGLE PH	208V SINGLE PH	208-230V 3 PH	208V-400 HZ	208V, 3PH, 50 HZ	FILTERED POWER	GROUND BUSBAR ON WALL	GROUNDING POINTS IN FLR OR HARDSTAND	COMMUNICATIONS	TELEPHONE	DATA CONNECTION	INTERCOM/PAGING/MASS NOTIFICATION	INTRUSION DETECTION SYSTEM	PANABLE ZOOM CAMERA	CATV	LIGHTING
ADMIN & SHOP CONTROL			•									•	•	•			•	•
TOOL ROOM			•	10	12							•	•	•				•
TOOL BOX STORAGE			•									•	•	•				•
COMBAT SPARES			11	10								•	•	•				•
LATRINES, SHOWERS, LOCKERS			•									•	•	•				•
TRAINING ROOM			•									•	•	•			•	•
BREAK, TRAINING & CONF			•									•	•	•			•	•
CONSOLIDATED BENCH REPAIR		•	•					•	•			•	•	•				•
WEAPONS STORAGE VAULT			•									•	•	•	•			•
COMSEC VAULT			•						•			•	•	•	•			•
NONSENSITIVE SECURE STORAGE			•									•	•	•				•
COMMUNICATION VEHICLE DOCK			•		5				•			•	•	•				•
CORRIDOR			•									•	•	•				•
MECHANICAL ROOM			•									•	•					•
ELECTRICAL ROOM			•									•	•					•
COMMUNICATIONS ROOM			•						•			•	•					•
SIPRNet ROOM			•						•			•						•
FLUID DISTRIBUTION			•									•	•	•				•
REPAIR AREAS	1	•	•	10	6		4		•	•		•	•	•		7		•
MAINTENANCE AREAS		•	•	•	6, 9		4		•	•		•	•	•		7		•
HARDSTAND					2	3				•		•						8
ORGANIZATIONAL STORAGE			•									9						•
UAV MAINT & STORAGE BLDG		•	•						•			•	•					•
HAZ WASTE & POL STORAGE BUILDINGS			•															•
DISTRIBUTION COMPANY STORAGE BLDG			•									9						•

Notes for Electrical TEMF Features Matrix

1. Provide power connections for hook-up of user procured (GFGI) portable steam cleaner for cleaning of engines and engine components in a pair of repair areas. Coordinate power requirements with the User.
2. MILVANS (100A), TOE vans (50A), Hospital (100A, 208V, 3-PH, 5-Wire).
3. LCSS Vans (to be discontinued in future), Patriot Missile Units.
4. For Engineers shop.
5. Communications Vans (100A).
6. Hospital units require 120/208V, 3-PH, 5-Wire connection
7. Provide power and conduit and wiring system(s) for user provided panable zoom camera system; monitored in Admin and Shop Control.
8. Lighting classification for pit lighting shall be determined during the design.
9. Provide 1-4" conduit with a 6 pair copper cable to the Distribution Company

Storage and Organizational Storage Buildings from the main communications room in the TEMF. Conduit and cable routing may be to the nearest telecommunications maintenance hole before routing cable back to the TEMF main communications room. Provide Protected Entrance Terminal (PET) with one 110 type block mounted on a 4 ft by 8 ft backboard mounted vertically. Backboard treatment shall be in accordance with I3A. Provide one wall mounted telephone outlet inside the building. Ground PET in accordance with 250.50 and 800.100 of NFPA 70 National Electrical Code.

10. Provide 208V single phase power in all Repair Areas and with weather proof connection for tire changing machine where shown on the TEMF Standard Drawings.

11. ASLMS Containers

a) The ASLMS Container is provided with the following:

1) Each ASLMS container comes with a set of two – 150 foot cables with each end plug identical. MS part number for the plug used on cable is MS3456W16-10P.

2) Electrical circuit is 20 ampere, 120 volt, single phase.

b) Provide the following power provisions for each ASLMS container:

1) Two dedicated 20 ampere, 120 volt, single phase circuits with a special receptacle for each circuit. MS part number for special receptacle to be provided is MS3451W16-10S.

12. SATS Containers

a) The SATS Container is provided with the following:

1) Integrated 10 KW generator (208V, 3 phase 60 Hz)

2) A wall mounted 100 Amp, 208 volt, 3-phase, 60 Hz AC conforming to MIL-C-22992, Class L, Style P comprised of a MS90558 C 44 4 shell, with an MS14055 insert having insert arrangement 44-12, along with a MS90564 44 C weather-tight cover.

3) Signal entry panel (SEP) with the following connections: RS 232 Male/Female small and large, RJ 11 (phone), RJ 45 (LAN), 10 Base 2 (BNC), and 10 Base T (Ethernet).

b) Provide the following power and data provisions for each SATS container:

1) A branch circuit sized to the full load capacity of the 10kw generator to a weatherproof wall mounted 100 amp disconnect switch located within the cable's reach.

2) A pre-manufacturer cable, stock number 5995-01-435-8697. This cable is 50 foot long with a plug for the SATS receptacle at one end and terminal connections on the other end. Connect the cable's terminal ends to the disconnect switch. Provide a means to hang the cable.

3) A weatherproof RJ 45 (phone) and RJ 45 (LAN) outlet with the conduit and cables (Category 6) to the Communication Room and connect per I3A requirements. Provide 50 feet of exterior cable with appropriate connectors on each end for each outlet. Provide a means to hang the cables.

3.3. References

(1) 40 CFR 261, Identification and Listing of Hazardous Waste

(2) 40 CFR 262, Standards Applicable to Generators of Hazardous Waste

(3) 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

(4) American Society of Mechanical Engineers (AMSE)

ASME HST-1, Performance Standard for Electric Chain Hoists

ASME HST-4, Performance Standard for Overhead Electric Wire Rope Hoists

(5) ANSI Z358.1, American National Standard for Emergency Eyewash and Shower Equipment

(6) Not used.

(7) AR 190-11, Physical Security of Arms, Ammunition, and Explosives (FOUO)

(8) AR 190-51, Security of Unclassified Army Property (Sensitive and Nonsensitive)

(9) AR 380-5, Department of the Army Information Security Program

(10) Crane Manufacturers Association of America (CMAA)

CMAA 70, Top Running and Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes, No. 70

CMAA 74, Top Running and Under Running Single Girder Electric Overhead Cranes
Utilizing Under Running Trolley Hoist, No. 74

- (11) Fed Spec AA-V-2737, Modular Vault Systems
- (12) TM 5-853-1, Security Engineering Project Development (FOUO)
- (13) UFC 3-550-3, Design: Electrical Power Supply and Distribution
- (14) AR 380-40, Policy for Safeguarding and Controlling Communications Security (COMSEC) Material (FOUO).
- (15) USACE STD 872-90-03, FE6 Chain-Link Security Fence Details

<REV>

Section:

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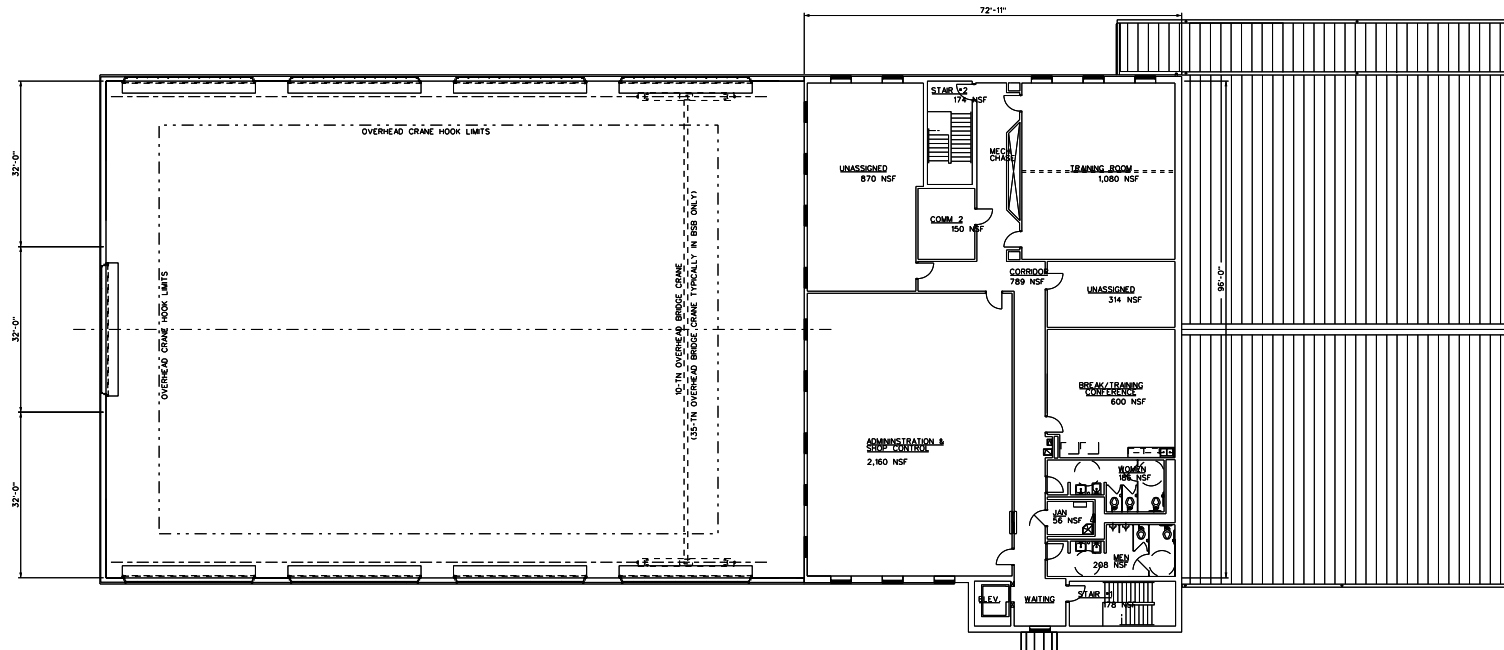
US ARMY CORPS
OF ENGINEERS
SAVANNAH

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U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS SAVANNAH DISTRICT	DESIGNED BY:	DATE:
	DRAWN BY:	SOLUTION NO.:
	SUBMITTED BY:	CONTRACT NO.:
	FILE NAME:	CATEGORY CODE:
	SIZE:	PLOT SCALE:
		PLOT DATE:

**MEDIUM TEMP
UPPER LEVEL
FLOOR PLAN**

PLATE
REFERENCE
NUMBER
A-102
SHEET



UPPER LEVEL FLOOR PLAN



7,554 SF

FLOOR PLAN INDICATES THE ARMY STANDARD SOLUTION IN SCHEMATIC FORM. DESIGNER OF RECORD IS ALLOWED TO MAKE ADJUSTMENTS FOR EXTERIOR FACADE/ARCHITECTURAL THEME, AND/OR TO ACCOMMODATE SPECIFIC BUILDING ENGINEERING SYSTEMS (STRUCTURAL, MECHANICAL, ELECTRICAL, FIRE PROTECTION, AND SUSTAINABLE DESIGN). THESE ADJUSTMENTS WILL BE EVALUATED BY THE CENTER OF STANDARDIZATION (COS) DURING ITS COMPLIANCE REVIEW. INNOVATIVE, COST SAVING SOLUTIONS WILL BE GIVEN PROPER CONSIDERATION BY THE COS, AND WILL BE ADOPTED AS APPROPRIATE.

AREAS SHOWN ON THE FLOOR PLAN ARE TO BE CONSIDERED NET PROGRAM REQUIREMENTS. MAXIMUM ALLOWABLE GROSS BUILDING AREA IS THE MAXIMUM GROSS SPACE PERMISSIBLE FOR THE FACILITY.

A REDUCED OVERALL GROSS AREA IS ACCEPTABLE IF ALL NET PROGRAM REQUIREMENTS AND ADJACENCIES ARE MET.

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$$$DGNSPEC$$$
$$$SYSTIME$$$
$$$USERNAME$$$

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4.0 APPLICABLE CRITERIA

Unless a specific document version or date is indicated, use criteria from the most current references as of the date of issue of the contract or task order, unless otherwise stated in the task order. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

Table 1: Industry Criteria

Air Conditioning and Refrigeration Institute (ARI)	
ARI 310/380	Packaged Terminal Air-Conditioners and Heat Pumps
ARI 440	Room Fan-Coil and Unit Ventilator
ANSI/ARI 430-99	Central Station Air Handling Units
ARI 445	Room Air-Induction Units
ARI 880	Air Terminals
Air Movement and Control Association (AMCA)	
AMCA 210	Laboratory Methods of Testing Fans for Rating
American Architectural Manufacturers Association (AAMA)	
AAMA 605	Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 607.1	Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
AAMA 1503	Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
American Association of State Highway and Transportation Officials (AASHTO)	
	Roadside Design Guide [guardrails, roadside safety devices]
	Standard Specifications for Transportation Materials and Methods of Sampling and Testing [Road Construction Materials]

	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
	Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide]
	A Policy of Geometric Design of Highways and Streets
American Bearing Manufacturers Association (AFBMA)	
AFBMA Std. 9	Load Ratings and Fatigue Life for Ball Bearings
AFBMA Std. 11	Load Ratings and Fatigue Life for Roller Bearings
American Boiler Manufacturers Association (ABMA)	
ABMA ISEI	Industry Standards and Engineering Information
American Concrete Institute	
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 530	Building Code Requirements for Masonry Structures
ADA Standards for Accessible Design	
See US Access Board	ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10.
American Institute of Steel Construction (AISC)	
	Manual of Steel Construction – 13 th Edition (or latest version)
American Iron and Steel Institute	
AISI/COS NASPEC 2001	North American Specification for the Design of Cold-Formed Steel Structural Members
American National Standards Institute 11 (ANSI)	

ANSI Z21.10.1	Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less
ANSI Z124.3	American National Standard for Plastic Lavatories
ANSI Z124.6	Plastic Sinks
ANSI Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
ANSI/IEEE C2-2007	National Electrical Safety Code
ANSI/AF&PA NDS-2001	National Design Specification for Wood Construction
American Society of Civil Engineers (ASCE)	
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 37	Design and Construction of Sanitary and Storm Sewers, Manuals and Reports on Engineering Practice [sanitary sewer and storm drain design criteria]
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation]
ASCE/SEI 41-06	Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation]
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)	
ASHRAE 90.1	ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASHRAE Guideline 1.1	The HVAC Commissioning Process
ASHRAE Handbooks	Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified)
ASHRAE Standard 15	Safety Standard for Refrigeration Systems
ASHRAE Standard 62.1	Ventilation for Acceptable Indoor Air Quality
American Society of Mechanical Engineers International (ASME)	

ASME BPVC SEC VII	Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers
ASME A17.1	Safety Code for Elevators and Escalators
ASME B 31 (Series)	Piping Codes
American Water Works Association (AWWA)	
	Standards [standards for water line materials and construction]
American Welding Society	
	Welding Handbook
	Welding Codes and Specifications (as applicable to application, see International Building Code for example)
Architectural Woodwork Institute (AWI)	
Version 1.2	AWI Quality Standards 7th Edition
Associated Air Balance Council (AABC)	
AABC MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems
	AABC Associated Air Balance Council Testing and Balance Procedures
ASTM International	
ASTM C1060-90(1997)	Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM E 779 (2003)	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1827-96(2002)	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
Builders Hardware Manufacturers Association (BHMA)	
ANSI/BHMA	American National Standards for Builders Hardware
Building Industry Consulting Service International	

	Telecommunications Distribution Methods Manual (TDMM)
	Customer-Owned Outside Plant Design Manual (CO-OSP)
Code of Federal Regulations (CFR)	
49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
10 CFR 430	Energy Conservation Program for Consumer Products
Consumer Electronics Association	
CEA 709.1B	Control Network Protocol Specification
CEA 709.3	Free-Topology Twisted-Pair Channel Specification
CEA 852	Tunneling Component Network Protocols Over Internet Protocol Channels
Electronic Industries Association (EIA)	
ANSI/EIA/TIA 568-B	Structured Cabling Series
ANSI/EIA/TIA 569-B And ANSI/EIA/TIA 569-B-1	Commercial Building Standard for Telecommunications Pathways and Spaces (includes 569-B-1 ADDENDUM)
ANSI/TIA/EIA-606-A	Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
J-STD EIA/TIA 607-A	Commercial Building Grounding and Bonding Requirements for Telecommunications
Federal Highway Administration (FHWA)	
	Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways]
FHWA-NHI-01-021	Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL
Illuminating Engineering Society of North America (IESNA)	
IESNA RP-1	Office Lighting

IESNA RP-8	Roadway Lighting
IESNA Lighting Handbook	Reference and Application
Institute of Electrical and Electronics Engineers Inc. (IEEE)	
	Standard for Use of the International System of Units (SI): the Modern Metric System
Standard 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
International Code Council (ICC)	
IBC	<p>International Building Code</p> <p>Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70.</p> <p>All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58.</p> <p>All references in the International Building Code to the International Fire Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01.</p>
IMC	<p>International Mechanical Code –</p> <p>Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1</p> <p>Note: For all references to “VENTILATION”, follow ASHRAE 62.1</p>
IRC	International Residential Code
IPC	International Plumbing Code
IEC	Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements.
IGC	International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquefied Petroleum Gas Code.
International Organization for Standardization (ISO)	
ISO 6781:1983	Qualitative detection of thermal irregularities in building envelopes –

	infrared method
LonMark International (LonMark)	
LonMark Interoperability Guidelines	(available at www.lonmark.org), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide
LonMark Resource Files	(available at www.lonmark.org), including Standard Network Variable Type (SNVT) definitions
Metal Building Manufacturers Association (MBMA)	
	Metal Building Systems Manual
Midwest Insulation Contractors Association (MICA)	
	National Commercial and Industrial Insulation Standards Manual
National Association of Corrosion Engineers International (NACE)	
NACE RP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0185	Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe
NACE RP0285	Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
NACE RP0286	Electrical Isolation of Cathodically Protected Pipelines
National Electrical Manufacturers Association (NEMA)	
National Environmental Balancing Bureau (NEBB)	
	Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems
National Fire Protection Association (NFPA)	
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Installation of Sprinkler Systems
NFPA 13R	Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems

NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 20	Installation of Centrifugal Fire Pumps
NFPA 24	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design]
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Motor Fuel Dispensing Facilities and Repair Garages
NFPA 31	Installation of Oil Burning Equipment
NFPA 54	National Fuel Gas Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 76	Fire Protection of Telecommunications Facilities
NFPA 80	Standard for Fire Doors and Fire Windows
NFPA 90a	Installation of Air Conditioning and Ventilating Systems
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
National Roofing Contractor's Association (NRCA)	
	Roofing and Waterproofing Manual
National Sanitation Foundation, International	
NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59, 169	Food Equipment Standards
ANSI/UL Std. 73, 197, 471,	Food Equipment Standards

621, 763	
CSA Std. C22.2 No. 109, 120, 195	Food Equipment Standards
Occupational Safety and Health Administration (OSHA)	
Title 29, Part 1926	OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction
Plumbing and Drainage Institute (PDI)	
PDI G 101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH201	Water Hammer Arrestors
Precast Concrete Institute	
PCI Design Handbook	Precast and Prestressed Concrete
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)	
SMACNA HVAC Duct Construction Standards	HVAC Duct Construction Standards - Metal and Flexible
SMACNA Architectural Manual	Architectural Sheet Metal Manual
SMACNA HVAC TAB	HVAC Systems - Testing, Adjusting and Balancing
State/Local Regulations	
	State Department of Transportation Standard Specifications for Highway and Bridge Construction
	Sedimentation and Erosion Control Design Requirements
	Environmental Control Requirements
	Storm Water Management Requirements
Steel Door Institute (SDI)	
ANSI A250.8/SDI 100	Standard Steel Doors and Frames
Steel Deck Institute	

	SDI Diaphragm Design Manual
Steel Joist Institute	
	Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders
Underwriters Laboratories (UL)	
UL 96A	Installation Requirements for Lightning Protection Systems
UL 300	Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas
UNITED STATES ACCESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD	
ADA and ABA Accessibility Guidelines for Buildings and Facilities	<p>ABA Accessibility Standard for DoD Facilities</p> <p>Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10.</p> <p>Excluded are:</p> <p>(a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion).</p> <p>(b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion).</p>
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES	
	FDA National Food Code
U.S. GREEN BUILDING COUNCIL (USGBC)	
LEED-NC	Green Building Rating System for New Construction & Major Renovations
	Application Guide for Multiple Buildings and On-Campus Building Projects

4.2. MILITARY CRITERIA

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)

4.2.2. Executive Order 12770: Metric Usage In Federal Government

(a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.

4.2.3. TB MED 530: Occupational and Environmental Health Food Sanitation

4.2.4. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning - applicable only to the extent specified in paragraph 5, herein.

4.2.5. UFC 3-580-01 Telecommunications Bldg Cabling Systems Planning/Design

4.2.6. UFC 3-600-01 Design: Fire Protection Engineering for Facilities

4.2.7. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

4.2.8. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse

(a) Note the option to use tie force method or alternate path design for Occupancy Category II.

4.2.9. UFC 4-021-01 Design and O&M: Mass Notification Systems

4.2.10. Technical Criteria for Installation Information Infrastructure Architecture (I3A)

(a) Email: DetrickISECI3Aguide@conus.army.mil

4.2.11. U.S. Army Information Systems Engineering Command (USAISEC) TG for the Integration of SECRET Internet Protocol (IP) Router Network (SIPRNET). See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.

5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains general technical requirements. See also Paragraph 3 for facility-specific technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed.

5.1. SITE PLANNING AND DESIGN

5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.

5.1.2. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See paragraph 3 for additional site planning requirements relating to building functions.

5.1.2.1. Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.

5.1.2.2. Dumpsters Pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.

5.1.2.3. Vehicular Circulation. Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational – privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.

5.1.2.4. Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.

5.1.2.5. Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible. Protect trees to be saved during the construction process from equipment.

5.1.2.6. Stormwater Management. Employ design and construction strategies (Best Management Practices) that reduce stormwater runoff, reduce discharges of polluted water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume and duration of flow to the maximum extent practicable. See paragraph 6, PROJECT SPECIFIC requirements for additional information.

5.1.3. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy.

5.1.4. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.

5.2. SITE ENGINEERING

5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.

5.2.2. SOILS:

5.2.2.1. A report has been prepared to characterize the subsurface conditions at the project site and is **appended to these specifications**. The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.

5.2.2.2. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.

5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

5.2.3.1. Design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectancy of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices.

5.2.3.2. Parking Requirements.

(a) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.

(b) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.

5.2.3.3. Sidewalks. Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable.

5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.

5.2.5. UTILITIES: See paragraph 6.4.6 for specific information on ownership of utilities and utility requirements. Meter all utilities (gas, water, and electric, as applicable) to each facility. For Government owned utilities, install meters that are wireless data transmission capable as well as have a continuous manual reading option. All meters will be capable of at least hourly data logging and transmission and provide consumption data for gas, water, and electricity. Gas and electric meters will also provide demand readings based on consumption over a maximum of

any 15 minute period. Configure all meters to transmit at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation.

5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

5.2.7. IRRIGATION. Landscape irrigation systems, if provided, shall comply with the following:

5.2.7.1. Irrigation Potable Water Use Reduction. Reduce irrigation potable water use 50 percent using LEED credit WE1.1 baseline, except where precluded by other project requirements.

5.2.8. EPA WaterSense Products and Contractors. Except where precluded by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.

5.3. ARCHITECTURE AND INTERIOR DESIGN:

This element will be evaluated per APPLICABLE CRITERIA under the quality focus.

5.3.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.

5.3.2. GENERAL: Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.

5.3.3. COMPUTATION OF AREAS: See APPENDIX Q for how to compute gross and net areas of the facility(ies).

5.3.4. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Exterior colors shall conform to the Installation requirements. See paragraph 6.

5.3.4.1. Building Numbers: Each building shall have exterior signage permanently attached on two faces of the building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage.

5.3.5. BUILDING INTERIOR

5.3.5.1. Space Configuration: Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

5.3.5.2. Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

5.3.5.3. Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordination of the building colors and finishes is necessary for a cohesive design. Color selections shall be appropriate for the building type. The use of color, texture and pattern shall be used to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Finishes should be selected with regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Color of Ceramic and porcelain tile grout shall be medium range color to help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items shall be coordinated with the building interior. Color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) shall match the ceiling color.

5.3.5.4. Circulation: Circulation schemes must support easy way finding within the building.

5.3.5.5. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.

5.3.5.6. Window Treatment: Interior window treatments with adjustable control shall be provided in all exterior window locations for control of day light coming in windows or privacy at night. Uniformity of treatment color and material shall be maintained to the maximum extent possible within a building.

5.3.6. COMPREHENSIVE INTERIOR DESIGN

5.3.6.1. Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building's interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package will include finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility.

The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package will include the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. The selection of furniture style, function and configuration will be coordinated with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection will include function and ergonomics, maintenance, durability, sustainability, comfort and cost.

5.4. STRUCTURAL DESIGN

5.4.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.

5.4.2. GENERAL: The structural system needs to be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.

5.4.3. LOADS: See paragraph 3 for facility specific (if applicable) and paragraph 6 for site and project specific structural loading criteria.

5.4.4. TERMITE TREATMENT: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm.

5.5. THERMAL PERFORMANCE

5.5.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.

5.5.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT. Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings.

5.5.2.1. Trace a continuous plane of air-tightness throughout the building envelope and make flexible and seal all moving joints.

5.5.2.2. The air barrier material(s) must have an air permeance not to exceed 0.004 cfm / sf at 0.3" wg (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178

5.5.2.3. Join and seal the air barrier material of each assembly in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components.

5.5.2.4. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement, or damage, and transfer the load to the structure.

5.5.2.5. Seal all penetrations of the air barrier. If any unavoidable penetrations of the air barrier by electrical boxes, plumbing fixture boxes, and other assemblies are not airtight, make them airtight by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly.

5.5.2.6. The air barrier must be durable to last the anticipated service life of the assembly.

5.5.2.7. Do not install lighting fixtures with ventilation holes through the air barrier

5.5.2.8. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers such as at elevator shafts.

5.5.2.9. Damper and control to close all ventilation or make-up air intakes and exhausts, atrium smoke exhausts and intakes, etc when leakage can occur during inactive periods.

5.5.2.10. Compartmentalize garages under buildings by providing air-tight vestibules at building access points.

5.5.2.11. Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.

5.5.2.12. Performance Criteria and Substantiation: Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:

(a) Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.25cfm/ft2 at a pressure differential of 0.3" w.g.(75 Pa) in accordance with ASTM's E 779 (2003) or E-1827-96 (2002). Accomplish tests using either pressurization or depressurization or both. Divide the volume of air leakage in cfm @ 0.3" w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft2 @ 0.3" w.g. (L/s.m2 @ 75 Pa). Do not test the building until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions so that repairs to the continuous air barrier, if needed to comply with the required air leakage rate, can be done in a timely manner.

(b) Test the completed building using Infrared Thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060-90(1997). Determine air leakage pathways using ASTM E 1186-03 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, and perform corrective work as necessary to achieve the whole building air leakage rate specified in (a) above.

(c) Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

5.6. PLUMBING

5.6.1. STANDARDS AND CODES: The plumbing system shall conform to APPLICABLE CRITERIA.

5.6.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, the design for underslab piping systems and underground piping serving chillers, cooling towers, etc, shall include features to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, piping should be suspended from the structure with adequate space provided below the pipe for the anticipated soil movement.

5.6.3. HOT WATER SYSTEMS: For Hot Water heating and supply, provide a minimum temp of 140 Deg F in the storage tank and a maximum of 110 Deg F at the fixture, unless specific appliances or equipment specifically require higher temperature water supply.

5.6.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in paragraph 3, design in accordance with ASHRAE Handbook Series (appropriate Chapters), ASHRAE Standard 90.1, and the energy conservation requirements of the contract. Size and place equipment so that it is easily accessible and removable for repair or replacement.

5.6.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).

5.6.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

5.6.7. NON-WATER USING URINALS: Urinals shall be vitreous china, wall-mounted, wall outlet, non-water using, with integral drain line connection, and with sealed replaceable cartridge or integral liquid seal trap. Either type shall use a biodegradable liquid to provide the seal and maintain a sanitary and odor-free environment. Install, test and maintain in accordance with manufacturer's recommendations. Slope the sanitary sewer branch line for non-water use urinals a minimum of 1/4 inch per foot. Do not use copper tube or pipe for drain lines that connect to the urinal. Manufacturer shall provide an operating manual and on-site training to installation operations personnel for the proper care and maintenance of the urinal. For complexes, non-water using urinals are not required for barracks type spaces.

5.6.8. BUILDING WATER USE REDUCTION. Reduce building potable water use in each building 20 percent using IPC 2006 fixture performance requirements baseline except where precluded by other project requirements.

5.6.9. Do not use engineered vent or Sovent® type drainage systems.

5.6.10. Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Follow ASHRAE Fundamentals Chapter 23, Insulation for Mechanical Systems, IMC paragraph 1107 and International Energy Conservation Code for pipe insulation requirements.

5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.7.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.

5.7.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power

receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.

5.7.3. POWER SERVICE: Primary service from the base electrical distribution system to the pad-mounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.

5.7.3.1. Spare Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.

5.7.4. TELECOMMUNICATION SERVICE: The project's facilities must connect to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.

5.7.5. LIGHTING: Lighting shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA).

5.7.5.1. Interior Lighting: Interior lighting shall utilize electronic ballast and energy efficient fluorescent lamps with a Correlated Color Temperature of 4100K. Compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 82 or higher. Linear fluorescent fixtures shall have a CRI of 85 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Surface mounted fixtures shall not be used on acoustical tile ceilings. An un-switched fixture with emergency ballast shall be provided at each entrance to the building.

5.7.6. TELECOMMUNICATION SYSTEM: All building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA to include I3A Technical Criteria and the UFC 3-580-01 Telecommunications Bldg Cabling Systems Planning/Design. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.

5.7.6.1. Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569 (includes Addendum B-1), and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See paragraph 5.8.2.5 for design of environmental systems for Telecommunications Rooms.

5.7.6.2. The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

5.7.6.3. Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.

5.7.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

5.8. HEATING, VENTILATING, AND AIR CONDITIONING

5.8.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.

5.8.2. DESIGN CONDITIONS.

5.8.2.1. Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1.

5.8.2.2. Design systems in geographical areas that meet the definition for high humidity in UFC 3-410-01FA in accordance with the special criteria for humid areas therein.

5.8.2.3. Cooling equipment may be oversized by up to 15 percent to account for recovery from night setback. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Provide ventilation air from a separate dedicated air handling unit (DOAU) for facilities using multiple single zone fan-coil type HVAC systems. Do not condition outside air through fan coil units. Avoid the use of direct expansion cooling coils in air handling units with constant running fans that handle outside air.

5.8.2.4. Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.

5.8.2.5. Environmental Requirements for Telecommunications Rooms. Comply with ANSI/EIA/TIA 569-B and 569 ADDENDUM-B-1.

5.8.3. BUILDING AUTOMATION SYSTEM. Provide a Building Automation System consisting of a building control network, and integrate the building control network into the UMCS as specified.

The building control network shall be a single complete non-proprietary Direct Digital Control (DDC) system for control of the heating, ventilating and air conditioning (HVAC) systems as specified herein. The building control network shall be an Open implementation of LONWORKS® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

5.8.3.1. The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

- (a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.
- (b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

5.8.3.2. All DDC Hardware shall:

- (a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.
- (b) Communicate over the control network via ANSI/EIA 709.1B exclusively.
- (c) Communicate with other DDC hardware using only SNVTs
- (d) Conform to the LonMark® Interoperability Guidelines.

- (e) Be locally powered; link power (over the control network) is not acceptable.
- (f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself
- (g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.
- (h) To the greatest extent practical, not rely on the control network to perform the application..

5.8.3.3. Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.

5.8.3.4. Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.

5.8.3.5. Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.

5.8.3.6. Each scheduled system shall accept a network variable of type SNVT_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.

5.8.3.7. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

5.8.3.8. Not Used

5.8.3.9. Perform all necessary actions needed to fully integrate the building control system. These actions include but are not limited to:

- Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.
- Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852.

5.8.3.10. Provide the following to the Government for review prior to acceptance of the system:

- The latest version of all software and user manuals required to program, configure and operate the system.
- Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
 - Device address and NodeID.
 - Input and Output SNVTs including SNVT Name, Type and Description.
 - Hardware I/O, including Type (AI, AO, BI, BO) and Description.
 - Alarm information including alarm limits and SNVT information.
 - Supervisory control information including SNVTs for trending and overrides.
 - Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at <https://eko.usace.army.mil/fa/besc/>
- Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses, IP addresses, and network names.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- LONWORKS® Network Services (LNS®) database for the completed system.

- Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

Table 5-1: QC Checklist

Instructions: Initial each item, sign and date verifying that the requirements have been met.		
#	Description	Initials
1	All DDC Hardware is installed on a TP/FT-10 local control bus.	
2	Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols and network variables other than SNVTs have not been used.	
3	All sequences are performed using DDC Hardware.	
4	LNS Database is up-to-date and accurately represents the final installed system	
5	All software has been licensed to the Government	
6	M&C software monitoring displays have been created for all building systems, including all override and display points indicated on Points Schedule drawings.	
7	Final As-built Drawings accurately represent the final installed system.	
8	O&M Instructions have been completed and submitted.	
9	Connections between the UMCS IP network and ANSI/CEA-709.1B building networks are through ANSI/CEA-852 Routers.	
By signing below I verify that all requirements of the contract, including but not limited to the above, been met.		
Signature: _____ Date: _____		

5.8.3.11. Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

5.8.3.12. Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

5.8.3.13. Provide training at the project site on the installed building system. Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

-

5.8.4. TESTING, ADJUSTING AND BALANCING. Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

5.8.5. COMMISSIONING: Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Fundamental commissioning, in accordance with ASHRAE Guideline 1.1, ASHRAE Guideline 0 and LEED. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. The Contractor shall hire the Commissioning Authority (CA), certified as a CA by AABC, NEBB, or TABB, as described in Guideline 1.1. The CA will be an independent contractor and not an employee or subcontractor of the Contractor or any other subcontractor on this project, including the design professionals (i.e., the DOR or their firm(s)). The Contracting Officer's Representative will act as the Owner's representative in performance of duties spelled out under OWNER in Annex F of ASHRAE Guideline 0.

5.9. ENERGY CONSERVATION

5.9.1. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.2. Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.3. Purchase Energy Star or FEMP designated products. The term "Energy Star product" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated product" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

5.9.4. Solar Hot Water Heating. Provide at least 30% of the domestic hot water requirements through solar heating methodologies, unless the results of a Life Cycle Cost Analysis (LCCA) developed utilizing the Building Life Cycle Cost Program (BLCC) which demonstrates that the solar hot water system is not life cycle cost effective in comparison with other hot water heating systems. The type of system will be established during the contract or task order competition and award phase, including submission of an LCCA for government evaluation to justify non-selection of solar hot water heating. The LCCA uses a study period of 25 years and the Appendix K utility cost information. The LCCA shall include life cycle cost comparisons to a baseline system to provide domestic hot water without solar components, analyzing at least three different methodologies for providing solar hot water to compare against the baseline system.

5.9.5. Process Water Conservation. When potable water is used to improve a building's energy efficiency, employ lifecycle cost effective water conservation measures, except where precluded by other project requirements.

5.9.6. Renewable Energy Features. The Government's goal is to implement on-site renewable energy generation for Government use when lifecycle cost effective. See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.

5.10. FIRE PROTECTION

5.10.1. STANDARDS AND CODES The fire protection system shall conform to APPLICABLE CRITERIA.

5.10.2. Inspect and test all fire suppression equipment and systems, fire pumps, and fire alarm and detection systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

5.10.3. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers.

5.10.4. Fire alarm and detection system: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.

5.10.5. Fire Protection Engineer Qualifications: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES, the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

5.11. SUSTAINABLE DESIGN

5.11.1. STANDARDS AND CODES: Sustainable design shall conform to APPLICABLE CRITERIA. See paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project. The LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC) applies to all projects. Averaging may be used for LEED compliance as permitted by the AGMBC but is restricted to only those buildings included in this project. Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and BUILDING WATER USE REDUCTION.

5.11.2. LEED RATING, REGISTRATION, VALIDATION AND CERTIFICATION: See Paragraph PROJECT-SPECIFIC REQUIREMENTS for project minimum LEED rating/achievement level, for facilities that are exempt from the minimum LEED rating, for LEED registration and LEED certification requirements and for other project-specific information and requirements.

5.11.2.1. Innovation and Design Credits. LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID credits that require any Owner actions or commitments are acceptable only when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance

5.11.3. OPTIMIZE ENERGY PERFORMANCE. : Project must earn, as a minimum, the points associated with compliance with paragraph ENERGY CONSERVATION. LEED documentation differs from documentation requirements for paragraph ENERGY CONSERVATION and both must be provided. For LEED-NC v2.2 projects you may substitute ASHRAE 90.1 2007 Appendix G in it's entirety for ASHRAE 90.1 2004 in accordance with USGBC Credit Interpretation Ruling dated 4/23/2008.

5.11.4. COMMISSIONING. See paragraph 5.8.5 COMMISSIONING for commissioning requirements. USACE templates for the required Basis of Design document and Commissioning Plan documents are available at <http://en.sas.usace.army.mil> (click on Engineering Criteria) and may be used at Contractor's option.

5.11.5. DAYLIGHTING. Except where precluded by other project requirements, do the following in at least 75 percent of all spaces occupied for critical visual tasks: achieve a 2 percent glazing factor (calculated in accordance with LEED credit EQ8.1) OR earn LEED Daylighting credit, provide appropriate glare control and provide either automatic dimming controls or occupant-accessible manual lighting controls.

5.11.6. LOW-EMITTING MATERIALS. Except where precluded by other project requirements, use materials with low pollutant emissions, including but not limited to composite wood products, adhesives, sealants, interior paints and finishes, carpet systems and furnishings,

5.11.7. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT. Except where precluded by other project requirements, earn LEED credit EQ 3.1 Construction IAQ Management Plan, During Construction and credit EQ 3.2 Construction IAQ Management Plan, Before Occupancy.

5.11.8. RECYCLED CONTENT. In addition to complying with section RECYCLED/RECOVERED MATERIALS, earn LEED credit MR4.1, Recycled Content, 10 percent except where precluded by other project requirements.

5.11.9. BIOBASED AND ENVIRONMENTALLY PREFERABLE PRODUCTS. Except where precluded by other project requirements, use materials with biobased content, materials with rapidly renewable content, FSC certified wood products and products that have a lesser or reduced effect on human health and the environment over their lifecycle to the maximum extent practicable.

5.11.10. FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM (FB4P). The Farm Security and Rural Investment Act (FSRIA) of 2002 required the U.S. Department of Agriculture (USDA) to create procurement preferences for biobased products that are applicable to all federal procurement (to designate products for biobased content). For all designated products that are used in this project, meet USDA biobased content rules for them except use of a designated product with USDA biobased content is not required if the biobased product (a) is not available within a reasonable time, (b) fails to meet performance standard or (c) is available only at an unreasonable price. For biobased content product designations, see <http://www.biopreferred.gov/ProposedAndFinalItemDesignations.aspx>.

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT: Achievement of 50% diversion, by weight, of all non-hazardous C&D waste debris is required. Reuse of excess soils, recycling of vegetation, alternative daily cover, and wood to energy are not considered diversion in this context, however the Contractor must track and report it. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.

5.13. SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.

- (a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation
- (b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports
- (c) Progressive collapse resistance for all facilities 3 stories or higher
- (d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)
- (e) For facilities with mailrooms (see paragraph 3 for applicability) – mailrooms have separate HVAC systems and are sealed from rest of building

6.0 PROJECT SPECIFIC REQUIREMENTS FORT BLISS, TX

6.1. GENERAL

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

6.2. APPROVED DEVIATIONS

The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

NONE

6.3. SITE PLANNING AND DESIGN

6.3.1. General

6.3.1.1. Site Preparation

(a) Plan, design, and construct all functional and technical site requirements listed in this project, including erosion control measures, underground conduit, piping, utility service lines and connections (electrical, communications, cable, water, sewer, stormwater, gas, mechanical), etc. within the project limits. The project limits are shown on the drawings. Base the site design upon conceptual site layouts provided in Appendix J.

6.3.1.2. Confine construction limits to the construction site boundaries for the specific facility location for the project.

6.3.1.3. Do not waste excess soil within the project limits without the written approval of the Government.

6.3.1.4. The Government may modify desired building placement within the site area to ensure adequate spacing between buildings and to ensure access is maintained. The Government will provide coordinates for two corners of the approved building location in order for the Contractor's surveyor to stake the site and building location.

6.3.2. Site Structures and Amenities

6.3.2.1. Provide the following site structures and amenities.:

(a) Dumpster Pad and Enclosure: Design and provide enclosure for dumpsters and recycling bins as required for facility size. Provide 6'-0" high rock wall enclosure. See Appendix J for requirements. Dumpster screening should be compatible with the building they serve and incorporates the concepts defined in the architectural theme in paragraph 6.5..

(b) POV Parking and Access Drives. Design and construct POV parking areas and access drives as outlined in Paragraph 5 and paragraph 6.5 .

(c) Provide fencing and enclosures in accordance with Appendix J.

(d) See Appendices AA and GG for additional requirements for Site Structures and Amenities.

6.3.3. Site Functional Requirements:

6.3.3.1. Stormwater Management (SWM) Systems.

(a) During construction of the facility the Contractor is responsible for SWPPP of the entire construction site limits. Coordinate the laydown spaces, haul roads and fabrication areas within the SWPPP.

(b) Storm Drainage – Design and install Storm Drainage. In areas where underground storm drainage piping exists, coordinate location and size for connection of roof drain leaders to the a storm water system with the Government prior to finalizing building design, but in any event, no later than 45 days prior to beginning building construction. Coordinate the storm water drainage system plan with the Government prior to finalizing building

design. Construct the permanent storm water drainage system concurrently with the construction of the facility and will require coordination with the Installation.

(c) Most of the storm water runoff from the Main Cantonment Area drains via channels and lift stations to the Fort Bliss sump to the north of Fred Wilson Road and east of the Union Pacific Railroad. From the Fort Bliss Sump outlet, storm water drains to a series of basins including Pershing Dam Basin and connects to the river through the City of El Paso's municipal separate storm sewer system (MS4). Fort Bliss Sump and Pershing Dam Basin are the operational responsibility of the City and are located on Fort Bliss Property under long term leases. There are other smaller interconnections with the City of El Paso's MS4 at the post boundary, mainly via curb and gutter flows from access roads to the post.

(d) Storm water drainage from Biggs AAF flight line area is collected via a system of catch-basins and conduits which ultimately flow into a retention pond located east of taxiway G. Prior to the current construction of new Biggs AAF facilities, storm water conveyance within the remaining Biggs Army Airfield area was handled by swales and sheet flow. These flows would then collect in low areas and evaporate and infiltrate over time.

(e) Prior to current development of the East Biggs Area, drainage was via sheet flow through natural topography where storm water would infiltrate and evaporate. The existing Biggs AAF area and the East Biggs Area are being developed using on-site storm water retention basins as there are no natural drainages or adjacent urban drainage infrastructure sufficient to receive the increased post development runoff. Consistent with City of El Paso design requirements, the design criteria used by the Land Development Engineer for the new Biggs AAF and East Biggs infrastructure is the 10 year event for storm water conveyance and 25 year event for storm water retention.

(f) Fort Bliss maintains a TCEQ Multi-Sector General Storm Water Permit (TXR050000) for industrial activities at the post and a Phase II Small (MS4) General Permit (TXR040000) for operation of the installation urban MS4.

(g) Graded Slope and Fills: The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures generally not to exceed 3:1 slope. In any event, plant slopes left exposed will, within 21 calendar days of completion of any phase of grading, or otherwise provide with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion. Demonstrate the angle for graded slopes and fills to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints.

(h) Ground Cover: Whenever land-disturbing activity is undertaken on a tract, the entity conducting the land-disturbing activity shall install plant or otherwise provide a permanent ground cover per Fort Bliss seeding specification or Blue Grama, 11.25 Kg/ha of Pure Live Seed, unhulled, for erosion control.

(i) Final Inspection. When all construction on the project is complete, the Erosion and Sediment Control Inspector will evaluate the site and all permanent erosion control features, permanent ground cover and off-site impacts to other properties. If found to be in compliance, a close-out letter will be issued.

(j) Design Storm. Provide erosion and sedimentation control measures, structures, and devices to provide protection from the calculated maximum peak rate of runoff from the twenty-five (25) year storm.

(k) Grade. Provide newly constructed open channels and storm drainage ponds with side slopes no steeper than three horizontal to one vertical if a vegetative cover is used for stabilization unless soil conditions permit a steeper slope or where the slopes are stabilized by using mechanical devices, structural devices, or other acceptable ditch lines. In any event, the angle for side slopes shall be sufficient to restrain accelerated erosion. Typically the storm drainage ponds shall have a 3-strand barb wire fence, except if approved otherwise by the DPW.

(l) Acceptable Management Measures. Measures applied alone or in combination to satisfy the intent of this section are acceptable if there are no objectionable secondary consequences. The Installation recognizes that the management of storm water runoff to minimize or control downstream channel and bank erosion is a developing technology.

6.3.3.2. Erosion and Sediment Control

The Texas Pollutant Discharge Elimination System (TPDES) oversees the Stormwater Sediment and Erosion Control Management Plan for the post. Comply with requirement general permit number TXR150000. Provide and maintain the SWPPP over the life of the project. Qualifying construction activities (greater than 1 acre) in the Texas

portion of the installation are conducted under the TCEQ Construction General Permit (TXR150000) or, in New Mexico, under the EPA Region VI Construction General Permit (FRL-8690-8; EPA-HQ-OW-2008-0238). Construction site operators on Fort Bliss meeting the definition in the permits of primary or secondary operator must comply with the appropriate state construction general permit. Depending on the execution mechanism of the project, the construction site operator may be all, or a combination of the Directorate of Public Works, US Army Corps of Engineers, the Land Development Engineer, Land Development Infrastructure Contractor, Design Build contractor or other entities meeting the definition.

6.3.3.3. Vehicular Circulation.

NOT USED

6.4. SITE ENGINEERING

6.4.1. The existing site survey for the project is included as Appendix JJ.. After award, conduct a site survey to establish survey control points and a coordinate system, based on UTM, 13N, WGS83., Identify horizontal and vertical data used. Bring any discrepancies which are found in the existing surveys to the attention of the Contracting Officer.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

6.4.2.1. Geotechnical borings, a boring location map, and the raw data on the subsurface conditions described in 5.2.2 are furnished as part of the RFP in Appendix A.

6.4.3. Fire Flow Tests. See Appendix D for Results of Fire Flow Tests to use for Basis of Design for Fire Flow and Domestic Water Supply Registration. In areas under development or planned development, see Appendix D for fire flow data to be used for the basis of proposal preparation and for design in lieu of actual fire flow tests.

6.4.4. Pavement Engineering and Traffic Estimates:

NOT USED

6.4.5. Traffic Signage and Pavement Markings

NOT USED

6.4.6. Base Utility Information

6.4.6.1. Temporary Utilities: Temporary water and electricity during construction will be made available at the project site. Establish a utilities sales contract with the DPW Utilities Office and pay the current government rates for utilities usage. Temporary utilities (water, sewer, and electricity) during construction are not available at the project site unless noted otherwise. Provide temporary utilities (water and electricity) to the site up to the POD when utilities are not available.

6.4.6.2. Permanent Utilities:

(a) General: Jack and bore utilities under existing paved roads. Install new utilities which connect to existing utilities under existing paved areas by open cut excavation. The assumed utility points of demarcation (POD) are shown in Appendix J. Design and construct up to the point of demarcation. During design, provide the site plan, loads, and utility timeline to the Utility Provider (UP) COR through the USACE COR. Coordinate utility connections with the UP COR through the USACE COR.

(a) Gas – Texas Gas Service owns the gas system. The Utility Provider will make the final connection. Pipe from the stub location to the building, including providing, installing, and connecting to the gas meter. Meter specifications and details are provided in Appendix BB – Meter Specs and Details. Install gas meter/regulator 2 to 3 feet from the building, more than five feet from any opening (Window, door, vent.)

(b) Electricity: Rio Grande Electric owns the electrical distribution system. During design, provide final building electrical loads, voltage requirements, and desired service locations to the UP COR through the USACE COR. The UP will construct the primary side from the point of connection to the point of demarcation, including meter and transformer. Meter specifications are provided in Appendix BB – Meter Specs and Details. Contractor will make

connection on the secondary side of the POD for electrical utilities. The electrical Utility Provider will energize only after a Government inspection deems it appropriate to do so. Note: a government inspector must physically verify that the secondary connection at the POD is appropriate and well grounded.

(c) Water: Fort Bliss Water and Sewer Services owns the water distribution system. The Utility Provider will make the final connection. but not including the water meter, meter box, and valve, located by the inside face of the curb. The DB Contractor POD will be up through the water meter. Install and connect to the water meter. Meter specifications and details are provided in Appendix BB – Meter Specs and Details.

(d) Sanitary Sewer: Fort Bliss Water and Sewer Services owns the sanitary sewer system. The Utility Provider will make the final connection. The DB Contractor POD will be up to but not including the two-way cleanout.

6.4.7. Cut and Fill

NOT USED

6.4.8. Borrow Material

NOT USED

6.4.9. Haul Routes and Staging Areas

6.4.9.1. A Map with available haul routes, construction water distribution point, construction entrance gate, common staging areas, landfill, and borrow areas (if applicable) is included in Appendix J. Disposal areas are off site and are the Contractor's responsibility.

6.4.10. Clearing and Grubbing:

Site grading will include clearing and grubbing for access drives, parking lots, and any site development

6.4.11. Landscaping:

6.4.11.1. Landscaping. Design and install landscaping in accordance with Appendix AA. Install landscaping perimeters required for ATFP

6.4.12. Turf:

NOT USED

6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein. The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color palettes, as described herein.

6.5.2. Design

6.5.2.1. Appendix F is provided "For Information Only", to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on the Installation's Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.

6.5.2.2. The design should address the Installations's identified preferences. Implement these preferences considering the following:

- (a) Achievable within the Contract Cost Limitation
- (b) Meets Milestones within Maximum Performance Duration.
- (c) Achieves Full Scope identified in this Solicitation.
- (d) Best Life-Cycle Cost Design
- (e) Meets the Specified Sustainable Design and LEED requirements.
- (f) Complies with Energy Conservation Requirements Specified in this RFP.

6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation's intent for this area is:

The Architectural theme is identified in the POL Truck Company Area Design Guide, see Appendix F. Site and Architectural conceptual drawings that meet this objective are shown in Appendix J.

6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.

6.5.2.5. See Appendix F for exterior colors that apply to Architectural character. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.

6.5.2.6. Additional architectural requirements:

- (a) Install fall protection anchor points on all roofs with a slope greater than 2:12
- (b) Architectural Design Objectives
 - a. 1. Exterior Walls: If a stucco look is desired in the Theme, use more durable materials such as EIFS or stucco-like finish on prefabricated metal panels or concrete panels. If EIFS is used, use a heavy duty reinforcing mesh around all doors and window openings, and extend a minimum 8'0" above finished floor elevation on all exterior walls. The heavy duty reinforcing mesh used on the EIFS shall have a minimum combined weight of 20 ounces per square yard and this standard can be met by using multiple layers. Use high impact mesh on all other surfaces.
 - 2. Roof:
 - a. Fully adhered, single ply Hypalon 45 mil / TPO 60 mil with a white color finish is required for flat roof systems. Minimum slope for flat roof system shall be 1/4 inch in 12 inches
 - b. Roof Mounted Equipment: Unless specifically required in Section 3 of the Scope of Work or the standard design provided herein, do not provide roof-mounted equipment. If roof-mounted equipment is provided, use modified bitumen roofing system.
 - c. Roof access from building exterior is prohibited.
 - d. Submit a Sample Warranty Certificate and Maintenance Guidelines for government review and concurrence prior to submission of final warranty. Provide a manufacturer's standard 20 year warranty. Warrant for 100 mph wind speed.
 - 3. Trim and Flashing

Gutters, downspouts, and fascias shall be factory pre-finished metal and shall comply with SMACNA Architectural Sheet Metal Manual. Provide for bird habitat mitigation.
 - 4. Bird Habitat Mitigation

Provide details necessary to eliminate the congregating and/or nesting of birds at, on, or in the facility.
 - 5. Connect boot wash drains to underground drainage.

6. Exterior Doors and Frames

- a. Main Entrance Doors: Main Entrance Doors: Aluminum storefront doors and frames with Architectural Class 1 anodized finish, fully glazed, with medium or wide stile are preferred for entry into lobbies or corridors.
- b. Exterior Non-Main Entrance Doors: Exterior doors and frames opening to spaces other than corridors or lobbies shall be insulated hollow metal.
- c. Side Entrance / Exit Doors: Exterior doors and frames opening to corridors shall be insulated hollow metal and comply with ANSI A250.8/SDI 100. Fire-rated openings shall comply with NFPA 80, and the requirements of the labeling authority. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements.

7. Exterior Doors Finish and Hardware

- a. Hardware General: All hardware in the facility shall be consistent and shall conform to ANSI/BMHA. Standards for Grade 1. Hardware finishes shall conform to ANSI/BHMA A156.18. Provide ANSI 626 (Satin Chromium plated on Brass or Bronze) or 630 (Stainless Steel). Disassembly of knob or lockset is not allowed in order to remove interchangeable core from lockset.
- b. Key locksets for mechanical rooms, electrical closets, and Telecommunications Rooms to the existing Post Engineer Key System without key removable cores.
- c. Auxiliary Hardware: ANSI/BHMA A156.16. Provide wall or floor stops for all exterior doors that do not have overhead holder/stops. Provide other hardware as necessary for a complete installation.

8. Exterior Windows:

Unless specifically required by the standard design, provide fixed windows. If the standard design requires operable windows, furnish windows with fiberglass or aluminum insect screens removable from the inside, secured with interior metal clips.

9. Exterior Louvers:

Design exterior louvers to exclude wind-driven rain, with bird screens and to withstand wind loads in accordance with the applicable codes. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. Louver finish shall be factory applied color.

10. Roof Hatches:

Roof access hatches shall be a minimum of 16 square feet in opening area, with no dimension smaller than 4'-0". Equip roof hatches with Post Engineer Master Lock on operating hardware.

11. Exterior Signage

See Appendix H for Exterior Signage requirements

12. Additional Requirements

See Appendix AA for additional architectural design requirements.

6.5.3. Programmable Electronic Key Card Access Systems: Programmable card key access systems are not required.

6.5.4. INTERIOR DESIGN

6.5.4.1. Interior building signage requirements: Furnish paper and software for creating text and symbols for computers for Owner production of paper inserts after project completion. Coordinate with user and installation facilities engineer (DPW). Provide Room Number and Room Function signage for all rooms, except apartment modules.

6.5.4.2. Interior Design Considerations:

- (a) Interior Partitions and Walls.
- (b) Interior Glass and Glazing: Coordinate the arrangement of fenestrations with the proposed furniture layout.

(c) Floors:

Provide durable and low maintenance materials

Carpet is not an allowable floor finish in corridors.

(d) Metal Support Systems

Non-load bearing metal studs and furring shall comply with ASTM C 645; stud gauge shall be as required by height and loading. Metal framing and furring system shall be capable of carrying a transverse load of 5psf without exceeding either allowable stress or a deflection of L/240, but shall not be less than 20 gauge. Provide galvanized finish.

(e) Gypsum Board

Comply with ASTM C 36. Minimum panel thickness shall be 5/8 inch. Provide moisture resistant panels (glass-mat panels are preferred) at locations subject to moisture. Glass-mat gypsum panels or water-resistant "greenboard" gypsum drywall shall be used as substrate for ceramic tile wall applications except at showers where cementitious backer board shall be used. Gypsum Board systems are to be constructed using Joint treatment per ASTM C 475, screws per ASTM C 646, and drywall installation per the requirements of ASTM C 840.

(f) Interior Doors and Frames

Provide hollow metal, flush solid core wood, or hollow core wood doors as specified below. All door frames shall be hollow metal.

1. Wood Doors: Provide flush solid core wood doors conforming to WDMA I.S.-1A. Stile edges shall be non-finger jointed hardwood compatible with face veneer. Provide Architectural Woodwork Institute (AWI) Grade A hardwood face veneer for transparent finished doors; provide AWI Sound Grade hardwood face veneer for painted doors. (Transparent finished doors are preferred.)
2. Wood Doors – Provide hollow core, Type II flush doors conforming to WDMA I.S 1-A. Provide Architectural Woodwork Institute (AWI) Grade A hardwood face veneer for transparent finished doors; provide AWI Sound Grade hardwood face veneer for painted doors. (Transparent finished doors are preferred.)
3. Hollow Metal Doors: Comply with ANSI A250.8/SDI 100. Doors shall be minimum Level 2, physical performance Level B, Model 2; factory primed.
4. Hollow Metal Frames: Comply with ANSI A250.8/SDI 100. Frames shall be minimum Level 2, 16 gauge, with continuously welded corners and seamless face joints; factory primed.

(g) Interior Door Finish Hardware:

1. Hardware General: All hardware in the facility shall be consistent and shall conform to ANSI/BMHA standards for Grade 1. All requirements for hardware keying shall be coordinated with the Contracting Officer. Hardware finish shall conform to ANSI/BHMA A156.18. Provide ANSI 626 (Satin Chromium plated on Brass or Bronze) or 630 (Stainless Steel.)
2. Key locksets for mechanical rooms, electrical closets, telecommunications rooms (TR), and crawl spaces to the existing Post Engineer Key System, consisting of a lever with a dead bolt cylinder above passage lockset, AR-1 keyway, without key removable cores, without key removable cores.
3. Auxiliary Hardware: ANSI/BHMA A156.16. Provide other hardware as necessary for a complete installation.
4. Locksets: Provide cylinders and cores with seven-pin tumblers for locks. Cylinders shall be products of one manufacturer, and cores shall be products of one manufacturer. Mortise cylinders, and knobs of bored locksets shall have interchangeable cores that are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core. Cylinders shall be fully compatible with products of the Best Lock Corporation, Arrow Lock Corporation, or Falcon Lock. Submit a core code sheet with the cores. Provide cores master keyed in one system for this project. Disassembly of knob or lockset is not allowed in order to remove interchangeable core from lockset. For interior locksets, use bored type vs. mortise lockset, to the maximum extent possible. The bored type lock will have a metal plate to prevent jimmying of lockset.

(h) Specialties And Furnishings:

1. Window Treatments: Provide aluminum horizontal mini-blinds or roller tube window shades (MechoEuroveil or equal) at all exterior glazing, except where noted otherwise. Provide roller tube window shades at clerestory windows or other difficult to access windows.

(i) Thermal Insulation: Do not install insulation directly on top of suspended acoustical panel ceiling systems.

(j) Elevators: Provide a State of Texas (or State of New Mexico, as applicable) licensed elevator inspector to inspect the elevator, test all new elevators, as applicable to the project, and to certify in writing that the installation meets all requirements.

(k) Provide 4 eye-bolts in each Arms Room / Vault, one in each corner. Eye bolts are to be drop forged steel, hot dip galvanized with a 1" diameter shank and a 2" diameter eye. Place bolt centered 6" above finished floor. Place each bolt 24" to the left of each room corner. Bolt shall be anchored so as to provide a minimum of 3.5 kips pull out strength. Place bolt to allow 1" of exposed shank between eye and surface of wall.

6.6. STRUCTURAL DESIGN

6.6.1. Site Specific Loading Requirements:

6.6.1.1. The basic wind speed, in miles per hour, for the determination of the wind loads shall be 100 mph 3-second-gust wind speed.

6.6.1.2. Use ground snow load of 5psf.

6.6.1.3. Use frost penetration of zero inches.

6.6.1.4. Use the following seismic acceleration parameters for mapped Maximum Considered Earthquake spectral response at short periods and at 1-second period, respectively: Ss: 31 (%g) and S1: 10 (%g).

6.6.2. Equipment Pads: Elevate floor or on-grade mounted equipment on minimum 4 inch thick concrete pads to prevent accumulation of water and metal corrosion.

6.7. THERMAL PERFORMANCE

There are no additional requirements other than those previously stated/referenced.

6.8. PLUMBING

6.8.1. Piping Materials: Use Type K copper for water supply under slab. Use CPVC and Type L (or above) copper for water supply above slabs. Use plastic pipe (schedule 40 PVC) for drainage and venting including under concrete slabs or inside buildings. Do not use exposed PVC for exposed vent piping above roof. Type M copper is not allowed.

6.8.2. Cross Connection Control: See the Fort Bliss Cross Connection Control Manual, located in Appendix E, for specific requirements for cross connection control and backflow prevention.

6.8.3. Provide gas plumbing for GF Clothes dryers (provided by others).

6.8.4. Do not use electric water heaters, except that small on-demand applications may be used.

6.8.5. Natural Gas Supply: Furnish standard gas pressures from building regulator of 8-15 ounces, 2 psi or 5 psi.

6.8.6. Gas Regulator Venting: Vent all gas regulators in building to the outside

6.8.7. Exterior Water Piping Freeze Protection: Design seasonally (not used in winter) utilized water supply piping for complete drain down including interior or below grade isolation valve. Insulate exposed water piping that is utilized year round and heat trace and protect with pipe jacketing to ensure that the piping will not freeze.

6.8.8. Fixture Faucet Mixing Valves: Provide single handle type mixing faucet valves with seals and seats combined into one replaceable cartridge; the cartridge shall be designed to be interchangeable between lavatories, bathtubs, kitchen and bar sinks, etc. or provide replaceable seals and seats that are removable either as a seat insert or as a part of a replaceable valve unit. Approved manufacturers are Delta, Kohler, Price Pfister, Crane.

6.8.9. Use automatic infrared metered-flow faucets at lavatory sinks in public areas.

6.8.10. Provide monitoring panel with Oil-Water Separators. Submit design for Government concurrence. Post a sign at entry locations to drain systems including oil-water separators (OWS), as specified in Appendix Y.

6.8.11. Provide cast iron valve boxes and covers. Water meter vaults shall have covers weighing 20 lbs or less or shall have a closeable opening in the cover directly above the meter to allow reading of the meter. Distance from top of cover to top of water meter consumption reading (dial) shall be less than 18 inches.

6.8.12. Not Used

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1. Exterior Lighting: Exterior site and area lighting, including lighting for parking areas, roadways, walkways, and ball courts shall be high pressure sodium, except compact fluorescent lighting shall be acceptable for walkway lighting. Photo control devices for exterior lighting shall conform to ANSI C136.10 and shall have an adjustable operation range of approximately 0.5 to 5.0 footcandles.

Provide seven 1 1/4" diameter conduits and pull wire and space for six 2-pole circuits for Parking Lighting. Extend conduits from the electrical room to a point 5 feet outside the concrete apron (approximately 30 feet outside the building line) to a point coordinated with and approved by the LDE.

6.9.2. Utility Metering: Provide Watt Node Plus LON Electric Power meter or equal. Provide pulse meter for gas and water. Provide a legibly and indelibly printed multiplier on the face of the meter. Wiring for UMCS system shall be compatible with Fort Bliss system. Install communications wiring in a 1" conduit from the Mechanical Room to the Pulse Kit on the Gas Meter for use by the UMCS system. Install communications wiring in a 1" conduit from the Mechanical Room to the Electric Meter for use by the UMCS system. Install communications wiring in a 1" conduit from the Mechanical Room to the Pulse Kit on the Water Meter for use by the UMCS system.

Exterior Electrical: Extend the electrical service underground from the secondary of the pad mounted transformer to building service equipment/main electrical switchgear. See paragraph SITE ENGINEERING above.

6.9.3. Exterior Communications: Install communications infrastructure as required by the drawings in Appendix J. Cable TV is to be included in the Site Communication duct bank. Coordinate with Fort Bliss DOIM / NEC Plans Office.

6.9.4. Corrosion Control: Obtain the services of a "corrosion expert" to design, supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic piping and tank systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract. The corrosion expert shall obtain soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Use sacrificial anode type cathodic protection.

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1. Facility Telecommunications systems:

6.10.1.1. Telephone and Local Area Network (LAN):

- (a) All equipment racks shall have both vertical and horizontal cable management.
- (b) Line all walls in the telecommunications rooms with 4' X 8' X 3/4" plywood, painted flat white. All plywood shall be fire-rated and the fire-retardant stamp are shall remain unpainted and open to view. Provide a ladder type cable tray around the perimeter of the telecommunications room and from the perimeter ladder tray to the 19" communications rack. Mount the ladder cable tray 7-1/2 feet above finished floor. Install all horizontal cabling into the TR in this cable tray routing them around the room and into the 19" rack.
- (c) Terminate the incoming fiber optic cable on a 19" twelve port single mode fiber optic patch panel with SC type connectors.
- (d) No construction deviations in the communications system from the accepted design will be permitted without prior Government review and concurrence.
- (e) Submit a detailed test plan for all the cable plant installation for government review and concurrence. Include information on the test equipment and its calibration documentation.
- (f) Feed all electrical circuits within a TR from an electrical panel installed within that room.
- (g) Provide a 1" conduit from the electrical panel in the TR to outside of the building for future commercial cable television power. Provide a 2" conduit (adjacent to the 1" conduit) from the TR to outside of the building for future commercial cable television service entrance.
- (h) Terminate Single-Mode and Multi-Mode Fiber Optic cables on separate patch panels.
- (i) Terminate voice and data cables on separate patch panels located in the same equipment rack. Install voice patch panels in the copper equipment rack or cabinet.
- (j) All raised flooring shall have a cable tray management system in compliance with UFC 3-580-01 under the floor for communications cabling. Submit a cable management plan showing cable routing and cable management system installation for review and concurrence prior to commencement of work.
- (k) Install the horizontal cabling conduit from the outlet box, extending to the cable tray. The use of J-hooks is not permitted without prior written approval.
- (l) Terminate exterior communications drops for testing purposes and cover with a blank weatherproof faceplate.
- (m) Use green insulation on all bonding jumpers, regardless of size.
- (n) Floor mount communications and power drops to be used by modular furniture including those for modular furniture near a wall. Submit a communications and power plan showing locations of communications and power drops superimposed over modular furniture plan with the interim and final design packages.
- (o) Manholes shall be splayed type communications MH's with preinstalled terminators and internal grounding.
- (p) Provide lockable, waterproof CMH covers. Submit for approval prior to use in accordance with Fort Bliss Force Protection Standards.

6.10.2. Cable TV (CATV): Provide and install a pre-wired CATV system throughout the designated spaces. CATV system shall include but not limit to cables, conduits, pull boxes, and CATV jacks. Route all CATV signals conduits and cables back to the telecommunication room.

6.10.3. Closed Circuit TV (CCTV): Provide and install a conduit system to support CCTV throughout the designated spaces. Conduit system shall include but not limit to conduits, pull boxes, and pull wires. Route all conduits for CCTV signals back to telecommunication room, or the designated monitoring room. As part of the Interim Design Review, present the proposed Floor Plan to representatives of Fort Bliss and 1AD Security personnel to identify specific locations of security cameras, location of monitoring room, conduit routing, and system details.

6.10.4. Intrusion Detection (IDS): Provide and install conduit for IDS in the designated areas. The devices (motion sensors, contact switches, duress buttons, keypads and security panels) are provided by others. Provide conduit and a junction box for each device. Route all device conduits to a j-box in a designated wall space (for a security panel) near the entrance of the room. Provide and install a 1" conduit with a Category 6 cable routed from the j-box to the nearest communications room. Terminate and certify the cable inside the j-box on an RJ-45 Female Jack and inside the communications room on a patch panel. Provide a dedicated 120V single-phase circuit for IDS.

- 6.10.5. General: Ground and bond all inside plant cable pathways (e.g. cable trays, cable ladders, and conduits) to the Main Telecommunication Room (TR) ground bar (TMGB). Bond Individual sections of all metallic cable tray and ladder systems to each other and to the raceway (e.g. EMT) in which they support.
- 6.10.6. Landscape/Irrigation Controls – Provide power and outlet to accommodate the irrigation controller for each building. Make space available for the irrigation controller in the mechanical room or where designated by the Government.
- 6.10.7. Not Used.
- 6.10.8. Provide a weathertight through-roof conduit from Comm Room to roof for installation of communication cable and Government installed roof-mounted antenna.
- 6.10.9. Outside electrical panels: all electrical panels located in exterior areas shall be dustproof.
- 6.10.10. Control exterior security lighting by a switch and photocell.
- 6.10.11.
- 6.10.12. Where SIPRNET is required, the SIPRNET distribution will be determined and engineered by the USAISec-FDED SIPRNET Team.
- 6.11. HEATING, VENTILATING, AND AIR CONDITIONING
- 6.11.1. General: The existing UMCS is LonWorks Open.
- 6.11.2. System Selection: Current local utility rates for gas, electric, water and sewer are contained in Appendix K. These are rates paid by Fort Bliss to the local utility providers and are for use in LEED energy cost calculations. Provide CO2 sensors in return air stream to minimize the amount of outside air required to satisfy ASHRAE 62.1 requirements for building Indoor Air Quality. Provide one CO2 sensor per HVAC zone. Installation infrastructure has insufficient capacity to support use of electric HVAC systems. Provide gas-fired and/or renewable energy sources for heating.
- 6.11.3. Communication Rooms: Air condition communications equipment rooms to space comfort conditions as per applicable criteria by separate year round direct expansion cooling systems.
- 6.11.4. Mechanical Room Ventilation: Automatically ventilate mechanical, fire protection, electrical, and storage spaces to limit space temperatures to 10 degrees F above design outdoor air temperature.
- 6.11.5. Equipment Coordination: For Variable Air Volume (VAV) systems, limit size of any individual VAV box to approximately 2500 cfm to promote better zoning and fit of equipment to space available. Coordinate all mechanical systems and equipment with space available to prevent conflict with other building systems.
- 6.11.6. UMCS Base-wide System and Building Control Interface: A base-wide UMCS/EMCS system has been installed as part of a separate contract. Provide a 3/4" conduit with CAT VI cable from the EMCS router to the nearest comm room for connection to the building LAN. Integration to the base-wide system shall be done under separate contract and is not part of this scope of work. The building shall be capable of running stand alone until such time it is integrated into the base-wide system. Energy saving controls are desired such as schedule start/stop, optimized start/stop, occupancy sensors, etc. Locate AC control panels and routers in the Mechanical Room.
- 6.11.7. Existing IP Network: Existing IP network consist of Gig-backbone: 10/100MB to the user, 1GB between the end user building and ADN, and a 10GB core backbone.
- 6.11.8. Network Media: Existing network media consist of single-mode fiber optic.
- 6.11.9. Head-end hardware/Software location: Location of head-end UMCS hardware/software will be in Bldg. 777.

6.11.10. Water Quality Analysis and Treatment: Water quality for Fort Bliss and surrounding area is 'hard'. Treatment will be required for use as make-up water in HVAC equipment. Water Quality Analysis reports are inserted as Appendix DD. Additional water analysis data from water treatment contractor (POC: Gary Hamilton, Delta Water Laboratories, 915-892-8227) are as follows:

Chlorides: 70 ppm

P Alkalinity: 0 ppm

M Alkalinity: 100 ppm (Total alkalinity)

Total Hardness: 130 ppm (CaCO₃)

ph: 7.89

Silica: 4 to 7 ppm (Can go as high as 11 ppm)

Iron: 0.01- 0.5 Reactive

Total Dissolved Solids: 475 to 680 ppm

Coordinate with water treatment contractor to confirm above data and current water treatment methods to obtain the required quantity and types of chemicals to be initially introduced into the closed loop heating and chilled water systems. Material Safety Data Sheets for current Ft. Bliss DPW chemical treatment method for hydronic water systems (Boiler heating hot water and chilled water) are contained in Appendix EE (Corrshield NT402).

6.11.11. Coordinate locations of emergency shut-off switches, central control area, and switch features with Fort Bliss DPW during design.

6.11.12. Not Used Evaporative cooling - Where evaporative cooling is provided, the preference for user occupied areas is that control be provided by temperature sensors instead of thermostats. The intent is to provide control of the space while not allowing occupant adjustment or intervention by adjustment of the space temperature set point. Provide ability for adjustment and maintenance of sensors by authorized personnel. Water softening is required where evaporative cooling is provided. Provide drain lines to drain to a specific location and not drain directly onto the roof.

6.11.13. HVAC Controls: Admin/Classrooms/Labs/Dining Facilities are to have a three-hour override switch on the thermostat.

6.11.14. HVAC Controls in Apartment Areas: The preference is that thermostatic control in each living unit be adjustable in allowing 2 deg F adjustment either side of design setpoints for heating and cooling. The UMCS system shall control the +/- 2 Deg F range limits and shall not be adjustable by the area occupant.

6.11.15. HVAC system preferences and requirements are:

(a) For air-conditioned core and related areas (central core work rooms, offices, conference rooms, laboratories, electronics repair shops, etc.): the preference is for heating, ventilating and air-conditioning systems that provide appropriate zoning and number of zones to allow comfort in spaces with varying occupancy (by time of day, etc.), exterior exposures, and internal loads due to equipment, door usage, etc. The expectation is for more rather than less zones to create an optimum balance of initial cost versus occupant comfort for peak human efficiency based upon temperature setpoints and thermal comfort requirements of this RFP. System complexity: provide integrated HVAC air handling system or systems that are only complex enough to meet all energy, quality and system longevity requirements and other goals of this RFP; this may entail economizers, will require proper air filtration provisions, etc.; additionally systems shall be fully accessible for maintenance and shall be easily and completely replaceable via removal through mechanical room doors, etc. HVAC system cooling shall occur within the HVAC air handling system(s) and be provided by electric refrigerated means, such as electric direct expansion, chilled water or other refrigerated cooling system..

- (b) For Communications (Comm) and Information Infrastructure (IT) Equipment Spaces: the normally preferred equipment would be a separate electrical DX cooling and electric heating fan coil type system or a small wall mounted heat pump for very small rooms. Obtain the internal equipment space (Comm/IT) heat loading and use that information for HVAC system design.
- (c) Mechanical and Fire Protection Room Heating and Ventilation; It is preferred that main mechanical and/or fire protection equipment spaces be heated with gas or hydronic unit heaters.
- (d) Arms Vaults: Provide a ceiling fan and unit heater only. Arms Vault is not to be served by the building central HVAC system.

6.11.16. Piping Materials: Do not use Type M copper.

6.11.17. Equipment Placement: Place air handling equipment within the building spaces (i.e. equipment rooms, etc.) which are sound isolated, within exterior on-grade equipment yards which are enclosed with screen walls. Or, if placed on roof, provide equipment with screening to prevent viewing of the equipment from a point 6 feet above any ground level at a distance of up to 300 feet from the building exterior wall in any direction. Organize vents, stacks, grilles, and placement of mechanical or electrical service fixtures into locations which do not provide visually negative design impacts. Avoid catwalks, especially when up and down travel is required to service multiple equipment pieces (coordinate with Architectural designer). Enclose mechanical and electrical equipment (transformers, chillers, boilers, etc.) installed at grade with screen walls. Screen wall finishes and appearance are subject to Government review and approval.

6.12. ENERGY CONSERVATION

6.12.1. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

No additional requirements

6.13. FIRE PROTECTION

6.13.1. The Fire Alarm Control Panel shall be fully compatible with the existing Monaco system presently in use at Fort Bliss. See Section 6.13.8 below for additional requirements.

6.13.2. HVAC Equipment Restart: After a fire alarm shut-down is cleared at fire alarm panel, affected mechanical equipment shall automatically restart.

6.13.3. Sprinkler Freeze Protection: Provide temperature sensor and alarm to notify fire department of possible freezing conditions for wet pipe sprinkler systems in spaces where heat may not be available due to being unoccupied or heating system may have failed. (Edit this paragraph as it applies to specific product lines for sprinklered storage / warehouse areas, hangars, maintenance areas, etc.)

6.13.4. Riser Location: Install fire risers in dedicated space or mechanical room with external access for fire department.

6.13.5. Provide and install a Fire Department Connection near the street curb, PIV, and fire hydrant. Coordinate exact location of Fire Department Connection with LDE and Fort Bliss Fire Department.

6.13.6. Fire Sprinkler Backflow Prevention: Backflow prevention shall be in accordance with the Fort Bliss Cross-Connection Control Manual. This requirement may be more stringent than the requirement in UFC 3-600-01.

6.13.7. Fire Alarm System:

6.13.7.1. The RF Transceiver shall be compatible with the Fire Department receiving system, operating on an RF frequency.

6.13.7.2. The RF transceiver shall be a Monaco BT-XM or approved equal operating on a frequency of 165.0625 MHZ.

- 6.13.7.3. The Fire alarm receiving system is a Monaco D-21 system.
- 6.13.7.4. The information sent to the Fire Department receiving system shall be zone by zone information.
- 6.13.7.5. All tamper devices shall be sent to the D-21 system as a supervisory tamper.
- 6.13.7.6. All initiating devices shall be connected, Style D, to signal line circuits (SLC), Style 6.
- 6.13.7.7. All alarm appliances shall be connected to notification appliance circuits (NAC), Style Z.
- 6.13.7.8. Provide photoelectric smoke detectors with 2.5% obscuration, pigtails for permanent connections, continuous power indicator light, test button, and metal base.
- 6.13.7.9. RF transceiver shall be equipped with a directional antenna.
- 6.13.8. Provide keyed alike fire alarm panels, keys C415A, 17021, & PK625; C415 for MNS panels. PK625 on manual pull stations. Sample keys are available from Fort Bliss Fire Department upon request..
- 6.13.9. Not Used.
- 6.13.10. Do not use glass or lockable doors in fire extinguisher cabinets.
- 6.13.11. Mass Notification System. Mount a speaker system on the exterior of the building that will cover a 16' wide area around the perimeter of the buildings.
- 6.13.11.1. Connect the MNS to the Fort Bliss Fire Alarm System utilizing the Monaco BT-XM All equipment must be compatible with the existing Monaco D21 Central Receiving Unit utilized by the Fort Bliss Fire Department.
- 6.13.11.2. Program the following 8 pre-recorded messages into the system:
- (a) MESSAGE #1. Label message "Fire". Five seconds of siren are played, followed by the message:
- "Attention, attention. A fire emergency has been reported. Please leave the building using the nearest exit or exit stairway. "Do not use the elevators if installed within this facility".
- (b) MESSAGE #2. Label message "Severe Weather." Five seconds of 100-kHz steady tone are played, followed by the message:
- "This is the Fort Bliss Installation Operations Center. The National Weather Service has issued a severe weather alert for this area. Turn on your radios or televisions for the latest update and take required action. Again, this is the Fort Bliss Installation Operations Center. The National Weather Service has issued a severe weather alert for this area. Turn on your radios or televisions for the latest update and take required action.
- (c) MESSAGE #3. Label message "Bomb" A horn sound is played for 5 seconds, followed by the message:
- "Attention, attention. This building has received a bomb threat. All personnel are to evacuate immediately using the nearest exit and to report to our designated re-assembly area for accountability and additional instruction. Again, this building has received a bomb threat. All personnel are to evacuate immediately using the nearest exit and to report to our designated re-assembly area for accountability and for additional instruction.
- (d) MESSAGE # 4. Label message "Shelter In Place" Three 1-kHz tones (one second each) are played, followed by the message:
- "Attention, attention. All personnel "shelter in place". Turn off fans, heating, ventilation and air condition systems. Close all doors and windows and remain indoors until the "All Clear" announcement is given."
- (e) MESSAGE #5. Label message "FPCON C" Three seconds of HI/LOW tones, followed by the message:

“Attention, attention. Fort Bliss is now at FPCON Charlie. Implement FPCON Alpha, Bravo and Charlie security plans immediately. Again, Fort Bliss is now at FPCON Charlie. Implement FPCON Alpha, Bravo and Charlie security plans immediately and stand by for additional information from the Fort Bliss Installation Operation Center.

(f) MESSAGE # 6. Label message “FPCON D” Three seconds of HI/LOW tones, followed by the message:

“Attention, attention. Fort Bliss is now at FPCON Delta. Implement all FPCON security plans, Alpha through Delta immediately. Again, Fort Bliss is now at FPCON Delta. Implement all FPCON security plans, Alpha through Delta immediately and stand by for additional information from the Fort Bliss Installation Operation Center.

(g) MESSAGE #7. Label message “All Clear”. Five seconds of chime sound are played, followed by the message:

“The emergency has now ended. Please resume normal operations. Thank you for your cooperation.”

(h) MESSAGE #8. Label message “Test” A 1-kHz tone is sounded for 2 seconds, followed by the message:

“May I have your attention, please? This is the Fort Bliss Installation Operations Center conducting a test of the mass notification system. Repeat, this is only a test.”

6.14. SUSTAINABLE DESIGN

6.14.1. LEED Rating Tool Version. Execute the project using LEED-NC Version 2.2.

6.14.2. The minimum requirement for this project is to achieve LEED Silver level. Each non-exempt facility (building plus sitework) must achieve this level. In addition to any facilities indicated as exempt in paragraph 3, the following facilities are exempt from the minimum LEED achievement requirement: *AM1 Organizational Storage, Haz-Mat, and Oil Storage buildings are exempt.*.

6.14.3. Credit Validation: LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is required. Registration and payment of registration fees will be by the Government. Administration/team management of the online project will be by the Contractor. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is not required. The Government may choose to seek LEED certification of the project, in which case the Government will pay certification fees and coordinate with the GBCI and the Contractor will furnish audit data as requested at no additional cost.

6.14.4. Commissioning: See Appendix M for Owner’s Project Requirements document(s).

6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

SS Credit 1 Site Selection:

Project site IS NOT considered prime farmland.

Project site is five feet or more above 100-year flood elevation.

Project site contains no habitat for threatened or endangered species.

No portion of project site lies within 100 feet of any water, wetlands or areas of special concern.

Project site WAS NOT previously used as public parkland.

SS Credit 2 Development Density & Community Connectivity.

Project site DOES NOT meets the criteria for this credit.

SS Credit 3 Brownfield Redevelopment.

Project site DOES NOT meets the criteria for this credit.

SS Credit 4.1 Public Transportation Access.

Project site DOES NOT meets the criteria for this credit.

EA Credit 6 Green Power.

35% of the project's electricity WILL NOT will be provided through an Installation renewable energy contract.

MR Credit 2 Construction Waste Management.

The Installation does not have an on-post recycling facility available for Contractor's use.

6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.

6.14.7. Not Used

6.14.8. Additional Information

16.14.8 Appendix M contains a modified LEED v2.2 Registered Project Checklist. This checklist identifies:

(a) Those specific credits/prerequisites that the D/B Contractor must provide (listed in the "Yes DB" column);

(b) Those credits prerequisites that the Government will provide (listed in the "Yes GOV" column);

(c) Those specific credits that the D/B Contractor may provide above and beyond those required (applies only to Energy and Atmosphere Credit 1, where 6 credits are required by other Army Regulations, but an additional 4 credits may be achievable at the D/B Contractor's option) listed in the "? D/B" column;

(d) Those credits that the Government may provide, but should not be considered by the D/B Contractor, listed in the "? GOV" column; and

(e) Those credits that the D/B Contractor is prohibited from pursuing (listed in the "NO" column).

6.14.9 In addition to the specific credits that the D/B Contractor is required to provide by the Checklist in Appendix M, achieve an additional 23 credits to be selected by the D/B Contractor.

6.15. ENVIRONMENTAL

6.15.1. Do not use Asbestos containing materials in the new construction.

6.15.2. The impacts of the Fort Bliss Expansion have been adequately addressed in the Fort Bliss, Texas and New Mexico Mission and Master Plan Programmatic Environmental Impact Statement (MMPEIS). The environmental documents that apply to this task order are the City of El Paso Rule Regulation #9 (available at http://www.epwu.org/PDF/rules_regs.pdf), as well as the following documents included in Appendix E: Potable Regulatory Policy (Policy Letter #16, Cross connection control manual for Fort Bliss, Installation environmental Noise Management Plan, Installation hazardous waste management plan, and the Cost Schedule for Hazmat disposal. Comply with all Federal, State, and Local environmental requirements.

6.16. PERMITS

6.16.1 Obtain digging permit from Fort Bliss DPW, unless any government installed utilities have not been turned over to Fort Bliss. In this case, coordinate with USACE prior to any digging.

6.16.2 See Appendix FF for Fort Bliss Access Control Policy

6.16.3 [Not Supplied - PS_Permits : PERMITS]

6.17. DEMOLITION

6.17.1 See Appendix E.

6.18. ADDITIONAL FACILITIES

In addition to the scope identified at Section 01 10 00, Paragraph 2, the following subparagraphs identify additional facilities required for each project. See Appendix J and MM for further information.

6.18.1. Sustainment Brigade additional facilities: No additional whole facility requirements.

6.18.2. THAAD additional facilities: Site improvements and supporting facilities, in support of the Company Operations Facility (COF) and road and tank trail construction. See Appendix J, KK and MM for additional information.

6.18.3 JLENS additional facilities: 300-foot diameter (7,850 SY) hardstand training pad and associated support infrastructure including, but not limited to, commercial power, lightning protection and grounding systems and telephone and internet connections. See Appendix J, KK and MM for additional information.

6.19 MAINTENANCE AND OTHER GENERAL REQUIREMENTS

6.19.1 The D/B Contractor shall provide training for Fort Bliss maintenance staff on all mechanical and electrical systems; additionally, the training shall be video recorded and the D/B Contractor shall provide 6 copies of the training in DVD format. See Section 00 73 10 SUPPLEMENTAL CONTRACT REQUIREMENTS for additional information.

6.20 SUPPLEMENTAL REQUIREMENTS

See Appendix KK for supplemental requirements for this project.

End of Section 01 10 00.DS 01

**SECTION 01 33 00.DS 01
SUBMITTAL PROCEDURES
(DESIGN-BUILD TASK ORDERS)**

1.0 GENERAL

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

1.0 GENERAL

1.1.1. This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 33 30 apply to this task order, except as otherwise specified herein.

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred. The Government will retain four (4) copies of the submittal and return one (1) copy(ies) of the submittal.

End of Section 01 33 00.DS 01

**SECTION 01 33 16.DS 01
DESIGN AFTER AWARD**

1.0 GENERAL INFORMATION

3.0 EXECUTION

3.7. FINAL DESIGN REQUIREMENTS

3.7.1.6. CAD System and Building Information Modeling (BIM)

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

3.9.2. Web based Design Submittals

3.9.3. Mailing of Design Submittals

ATTACHMENT F BUILDING INFORMATION MODELING REQUIREMENTS

1.0 GENERAL INFORMATION

1.1. This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 33 16 apply to this task order, except as otherwise specified herein.

3.0 EXECUTION

3.7. FINAL DESIGN REQUIREMENTS

3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with AutoCAD 2000 or higher. Save all design CAD files as AutoCAD 2000 or higher files. All submitted BIM Models and associated Facility Data shall be fully compatible with Bentley BIM file format and the USACE Bentley BIM v8 Workspace.

(a) CAD Data Final File Format: During the design development the contractor shall capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.

(b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.

(c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Drawing files with external references or special fonts are not acceptable. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.

(d) See Attachment F for additional BIM requirements. BIM Model and associated Facility Data files shall be delivered in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.

(e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.

(f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

Activity and Address	Drawing Size (Full Size) Full Size Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) Half Full Sets/ *Partial Sets	Non-BIM Data CD-ROM or DVD as Necessary (PDF& .dwg)	Furniture Submittal (FFE)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Commander, U.S.Army Engineer District Ft. Worth District	1/0	8/0	8/0	8	2	2	1
Commander, U.S.Army Engineer District, Center of Standardization Savannah District	0/0	1/0	1/0	3	0	0	1
Installation	0/0	8/0	15/0	29	2	2	1
U.S.Army Corps of Engineers Construction Area Office	0/0	4/0	4/0	4	2	2	1
Information Systems Engineering Command (ISEC)	0/1	0/1	0/1	1	N/A	N/A	0
Other Offices	0/0	4/0	4/0	7	2	2	1

***NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.**

****NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.**

3.9.2. Web based Design Submittals

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

3.9.3. Mailing of Design Submittals

3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to twenty (20) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.

3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design, such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

ATTACHMENT F

Version 01-04-08

BUILDING INFORMATION MODELING REQUIREMENTS**1.0 Section 1 - Submittal Format**

1.1. Design Deliverables. Develop all designs using Building Information Modeling (BIM) and Computer Aided Design (CAD) software. Design submittal drawings shall be Full Size size, suitable for half-size (11"x17") scaled reproduction.

2.0 Section 2 – Design Requirements

2.1. Drawings. Deliver CAD files used for the creation of the Construction Documents Drawings per requirements in Section 01 33 16, the criteria of the USACE Tulsa District District, and as noted herein. Specification of a CAD file format for these Drawings does not limit which BIM application(s) or software(s) may be used for project development and execution.

2.2. BIM Model and Facility Data. Contractor shall select BIM application(s) and software(s) and develop project designs using BIM software. Use 3D graphic model(s) (the "Model") and associated intelligent attribute data ("Facility Data") created by this software to produce accurate Construction Documents. The Contractor will be provided with the Corps of Engineers BIM Workspace CD based on the Bentley System BIM to be utilized for submittals. The Contractor may be provided a baseline multi-discipline BIM Project Workspace for a CoS Facility Standard Design in the Bentley BIM v8 format for the purpose of site adaptation. The Workspace is dependent on specific versions of the Bentley BIM suite of products and only the versions of the software that are listed in the Contractor instructions included on the USACE BIM Workspace CD are permitted to be used.

2.2.1. IFC Coordination View. The Contractor's selected BIM application(s) and software(s) must be certified in the IFC Coordination View (2x3 or better. See www.iai-na.org). Submit any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment for Government approval.

2.2.2. Submittal Requirements. BIM submittals shall be fully compatible with the Bentley BIM format version Workspace and conform to the requirements of Section 3 and 4 below.

2.2.3. Implementation Plan.

2.2.3.1. Prior to the Initial Design Conference, submit an Implementation Plan, documenting viability of the BIM design and analysis technologies selected for the Project Model (integrated with the AEC CAD Standard) from concept development through As-Builts as a design, production, coordination, construction, and documentation tool and the collaborative process by which it shall be implemented.

2.2.3.2. The Implementation Plan shall describe uses of BIM during design and construction phases to include value management, interference management, and design-change tracking, or such other uses as the Contractor proposes. Refer to ERDC TR06-10, "Building Information Modeling (BIM) A Road Map for Implementation To Support MILCON Transformation and Civil Works Projects within the U.S. Army Corps of Engineers" for more information at <https://caddim.usace.army.mil/default.aspx?p=s&t=19&i=1>.

2.2.3.3. The Implementation Plan shall identify how the BIM data shall be managed and interoperate (data storage, sharing, viewing, quality control parameters in Section 2.3 Quality Control, and updating, as necessary) among all Contractor team members.

2.2.3.4. Conduct an Implementation Plan demonstration at the Initial Design Conference to review the Implementation Plan for clarification, and to verify the functionality of Model technology workflow and processes. The Government shall confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated into the Plan. If modifications are required, the Contractor shall execute the modifications and resubmit the final Implementation Plan for Government acceptance. There will be no payment for design or construction until the Plan is acceptable to the Government. The Government may also withhold payment for design and construction for unacceptable performance in executing the Implementation Plan.

2.2.4. Model Components. The Model shall include the following, subject to Government concurrence:

2.2.4.1. Project Specific BIM Facility Data. Develop the Facility Data, consisting of a set of intelligent elements for the Model (e.g., doors, air handlers, electrical panels). This Facility Data shall include all material definitions, qualities, and attributes that are necessary for the Project facility design.

2.2.4.2. Project Specific Minimum Requirements. The Contractor's Model shall include, at a minimum, the requirements of Section 4 below. The Government must agree with any proposed modifications to minimum requirements before incorporation into the Model.

2.2.4.3. Facility Data Output. Each submittal under Section 3 shall include a list of Construction Documents (e.g., drawings, elevations, design sections and schedules, details) that shall be produced from the Facility Data and updated as necessary.

2.2.4.4. Model Granularity. Models may vary in level of detail for individual elements within a model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g. at least 1/16th, 1/8th and 1/4th), or appropriately scaled civil drawings.

2.3. Quality Control. Implement quality control (QC) parameters for the Model, including:

2.3.1. Standards Checks. QC checking performed to ensure that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per the A/E/C CADD Standard.

2.3.2. Model Integrity Checks. QC validation used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements. Report non-compliant elements and provide justification acceptable to the Government if allowed to remain within the Model.

2.3.3. Other Parameters. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for concurrence.

2.4. Design and Construction Reviews. Perform design and construction reviews at each submittal stage under Section 3 to test the Model, including:

2.4.1. Visual Checks. Checking to ensure the design intent has been followed and that there are no unintended elements in the Model.

2.4.2. Interference Management Checks. Locating conflicting spatial data in the Model where two elements are occupying the same physical space. Log hard interferences (e.g., mechanical vs. structural or mechanical vs. mechanical overlaps in the same location) and soft interferences (conflicts regarding service access, fireproofing, insulation) in a written report and resolve.

2.4.3. IFC Coordination View. Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.

2.4.4. Other Parameters. Develop such other Review parameters as the Contractor deems appropriate for the Project and provide to the Government for concurrence..

3.0 Section 3 – Design Stage Submittal Requirements

3.1. Submittal Requirements.

3.1.1. Provide submittals in compliance with Implementation Plan deliverables at stages as described hereinafter.

3.1.2. Provide a Contractor-certified written report with each design submittal, confirming that consistency checks as identified in Paragraphs 2.3 and 2.4 have been completed for the design submittal. This report shall be discussed as part of the design review conference and shall address cross-discipline interferences, if any.

3.1.3. Following Government review and concurrence at each Stage in Paragraphs 3.3 through 3.5, provide the Government a 3-D interactive visualization from the Model in Bentley Navigator, Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or equivalent format. The Government may request other formats if needed to address Project-specific requirements.

3.2. Preliminary Implementation Review. Prior to the first Interim Design Submittal or Over-the-Shoulder Progress Review, demonstrate preliminary development of Model components and Facility Data identified in Paragraph 'Model Components'. Review the Model with the Government for conformity to program, massing, circulation, fire protection, security and sustainability Project requirements consistent with the Implementation Plan.

3.3. Interim Design Submittals.

3.3.1. BIM and CAD Data. The Model shall include architectural, interior design, structural, mechanical, electrical, plumbing and fire protection systems and Facility Data, as applicable to the Interim Design package(s). Provide the Model, Facility, Workspace and CAD Data files in native Bentley BIM/CAD and interoperable formats per Implementation Plan requirements, and any rendering files, on DVD/CD-ROM.

3.4. Final Design Submissions and Design Complete Submittals.

3.4.1. BIM and CAD Data. The Model shall include all design elements identified in Section 4, unless otherwise agreed by the Government. Secure Government acceptance of the Model from the Government before proceeding with commencement of construction, as described in paragraph 3.7.6 of Section 01 33 16. Provide the updated Model, Facility, Workspace and CAD Data and rendering files on DVD/CD-ROM.

3.5. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.

3.6. Final As-Builts BIM and CAD Data. Submit the final Model, Facility Data, and CAD files reflecting as-built conditions for Government Approval, as specified in Section 01 78 02.00 10, PROJECT CLOSEOUT.

4.0 Section 4 – BIM Model Minimum Requirements and Output

4.1. General Provisions. The deliverable Model shall be developed to include the systems described below as they would be built and the processes of installing them, and to reflect final as-built conditions. The deliverable model at the interim design stage and at the final design stage ("released for construction") shall be developed to include as many of the systems described below as are necessary and appropriate at that design stage.

4.2. Architectural/Interior Design. The Architectural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.2.1. Spaces. The Model shall include spaces defining accurate net square footage and net volume, and holding data for the room finish schedule for including room names and numbers. Include Programmatic Information provided by the Government or validated program to verify design space against programmed space, using this information to validate area quantities.

4.2.2. Walls and Curtain Walls. Each wall shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect wall types. The Model shall include all walls, both interior and exterior, and the necessary intelligence to produce accurate plans, sections and elevations depicting these design elements

4.2.3. Doors, Windows and Louvers. Doors, windows and louvers shall be depicted to represent their actual size, type and location. Doors and windows shall be modeled with the necessary intelligence to produce accurate window and door schedules.

4.2.4. Roof. The Model shall include the roof configuration, drainage system, major penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

4.2.5. Floors. The floor slab shall be developed in the structural Model and then referenced by the architectural Model for each floor of the Project building.

4.2.6. Ceilings. All heights and other dimensions of ceilings, including soffits, ceiling materials, or other special conditions shall be depicted in the Model with the necessary intelligence to produce accurate plans, building sections and generic wall sections where ceiling design elements are depicted.

4.2.7. Vertical Circulation. All continuous vertical components (i.e., non-structural shafts, architectural stairs, handrails and guardrails) shall be accurately depicted and shall include the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.8. Architectural Specialties and Woodwork. All architectural specialties (i.e., toilet room accessories, toilet partitions, grab bars, lockers, and display cases) and woodwork (i.e., cabinetry and counters) shall be accurately depicted with the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.9. Signage. The Model shall include all signage and the necessary intelligence to produce accurate plans and schedules.

4.2.10. Schedules. Provide door, window, hardware, sets using BHMA designations, flooring, and wall finish, and signage schedules from the Model, indicating the type, materials and finishes used in the design.

4.3. Furniture/Fixtures/Equipment. 3D representation of FFE elements is preferred. For projects with an extensive systems furniture layout that may impact BIM system performance the Contractor will contact the Government for consideration of 2D representation. The FFE systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.3.1. Furniture. The furniture systems Model may vary in level of detail for individual elements within a Model, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing, and shall include all relevant office equipment and furniture system layouts, with necessary intelligence to produce accurate plans, sections, perspectives and elevations necessary to completely depict furniture systems locations and sizes.

4.3.1.1. System Coordination. Furniture that makes use of electrical, data, plumbing or other features shall include the necessary intelligence to produce coordinated documents and data.

4.3.2. Fixtures and Equipment. Fixtures and equipment shall be depicted to meet layout requirements with the necessary intelligence to produce accurate plans, elevations, sections and schedules depicting their configuration

4.3.3. Schedules. Provide furniture and equipment schedules from the model indicating the materials, finishes, mechanical, and electrical requirements.

4.4. Structural. The structural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.4.1. Foundations. All necessary foundation and/or footing elements, with necessary intelligence to produce accurate plans and elevations.

4.4.2. Floor Slabs. Structural floor slabs shall be depicted, including all necessary recesses, curbs, pads, closure pours, and major penetrations accurately depicted.

4.4.3. Structural Steel. All steel columns, primary and secondary framing members, and steel bracing for the roof and floor systems (including decks), including all necessary intelligence to produce accurate structural steel framing plans and related building/wall sections.

- 4.4.4. Cast-in-Place Concrete. All walls, columns, and beams, including necessary intelligence to produce accurate plans and building/wall sections depicting cast-in-place concrete elements.
- 4.4.5. Expansion/Contraction Joints. Joints shall be accurately depicted.
- 4.4.6. Stairs. The structural Model shall include all necessary openings and framing members for stair systems, including necessary intelligence to produce accurate plans and building/wall sections depicting stair design elements.
- 4.4.7. Shafts and Pits. The structural Model shall include all necessary shafts, pits, and openings, including necessary intelligence to produce accurate plans and building/wall sections depicting these design elements.
- 4.5. Mechanical. The mechanical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2" NPS) field-routed piping is not required in the model unless there are space constraints, is necessary for procurement or estimating purposes, or is essential to show operation. Additional minimum Model requirements include:
- 4.5.1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution ducts for supply, return, and ventilation and exhaust ducts, including control system, registers, diffusers, grills and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules. All piping 1-1/2" NPS and larger shall be modeled.
- 4.5.1.1. Mechanical Piping. All necessary piping and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules. All piping larger than 1.5" diameter shall be modeled.
- 4.5.2. Plumbing. All necessary plumbing piping and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All piping larger than 1.5" diameter shall be modeled.
- 4.5.3. Equipment Clearances. All HVAC and Plumbing equipment clearances shall be modeled for use in interference management and maintenance access requirements.
- 4.5.4. Elevator Equipment. The Model shall include the necessary equipment and control system, including necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.
- 4.6. Electrical/Telecommunications. The electrical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2"Ø) field-routed conduit is not required in the BIM model unless there are space constraints, is necessary for procurement or estimating purposes, or is essential to show operation. Additional minimum Model requirements include:
- 4.6.1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards and control systems), including necessary intelligence to produce accurate plans, details and schedules. Cable tray routing shall be modeled without detail of cable contents. Lighting and power built into furniture/equipment shall be modeled.
- 4.6.2. Special Electrical Systems. All necessary special electrical components (i.e., security, Mass Notification, Public Address, nurse call and other special occupancies, and control systems), including necessary intelligence to produce accurate plans, details and schedules.
- 4.6.3. Grounding Systems. All necessary grounding components (i.e., lightning protection systems, static grounding systems, communications grounding systems, bonding), including necessary intelligence to produce accurate plans, details and schedules.
- 4.6.4. Communications. All existing and new communications service controls and connections, both above ground and underground with necessary intelligence to produce accurate plans, details and schedules. Cable tray

routing shall be modeled without detail of cable contents. Communications conduit larger than 1.5" shall be modeled.

4.6.5. Exterior Building Lighting. All necessary exterior lighting with necessary intelligence to produce accurate plans, elevations and schedules. The exterior building lighting Model shall include all necessary lighting, relevant existing and proposed support utility lines and equipment required with necessary intelligence to produce accurate plans, details and schedules.

4.6.6. Equipment Clearances. All lighting and communications equipment clearances and no-fly zones shall be modeled for use in interference management and maintenance access requirements.

4.7. Fire Protection. The fire protection system Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.7.1. Fire Protection System. All relevant fire protection components (i.e., branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors, control panels) with necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All fire protection piping shall be modeled.

4.7.2. Fire Alarms. Fire alarm/mass notification devices and detection system shall be indicated with necessary intelligence to produce accurate plans depicting them.

4.8. Civil. The civil Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1"=100') scaled drawing. Additional minimum Model requirements include:

4.8.1. Terrain (DTM). All relevant site conditions and proposed grading, including necessary intelligence to produce accurate Project site topographical plans and cross sections.

4.8.2. Drainage. All existing and new drainage piping, including upgrades thereto, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.8.3. Storm Water and Sanitary Sewers. All existing and new sewer structures and piping, including upgrades thereto, on the Project site with necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.8.4. Utilities. All necessary new utilities connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, including necessary intelligence to produce accurate plans and site-sections.

4.8.5. Roads and Parking. All necessary roadways and parking lots or parking structures, including necessary intelligence to produce accurate plans, profiles and cross-sections.

5.0 Section 5 - Ownership and Rights in Data

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

6.0 Section 6 – Contractor Electives

6.1. Applicable Criteria. If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit during the source selection, as described in the proposal submission requirements and evaluation criteria, the following criteria are requirements, as applicable to those elective feature(s).

6.2. COBIE Compliance. The Model and Facility Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements, including all requirements for the indexing and submission of

Portable Document Format (PDF) and other appropriate file formats that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.

6.2.1. Electronic Exchange. The National Building Information Model Standard (NBIMS) COBIE format shall be used for electronic exchange on this Project. Compile a COBIE index on the Microsoft Excel spreadsheet provided by NBIMS at www.nbims.org. Unless otherwise noted, also provide information identified in the COBIE Pilot Implementation Standard worksheets.

6.3. Project Scheduling using the Model. In the Implementation Plan and during the Preliminary Implementation Review, provide an overview of the use of BIM in the development and support of the project construction schedule.

6.3.1. Submittal Requirements. During the Submittal stages, the Contractor shall deliver the construction schedule with information derived from the Model.

6.3.1.1. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for project scheduling.

6.4. Cost Estimating. In the Implementation Plan and during the Preliminary Implementation Review, provide an overview of the use of BIM in the development and support of cost estimating requirements, or other applications such as cost analysis and estimate validation.

6.4.1. Submittal Requirements. During the Submittal stages, the Contractor shall deliver cost estimating information derived from the Model.

6.4.2. Project completion. At project completion, the Contractor shall provide an MII (Micro Computer Aided Cost Estimating System Generation II) Cost Estimate which follows the USACE Cost Engineering Military Work Breakdown System (WBS), a modified uniformat, to at least the sub-systems level and uses quantity information supplied directly from BIM output to the maximum extent possible, though other "Gap" quantity information will be included as necessary for a complete and accurate cost estimate.

6.4.2.1. Sub system level extracted quantities from the BIM for use within the estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. Therefore, when developing a BIM, the designer shall be cognizant of what tasks need to be separated appropriately at the beginning stages of model development, such as tasks done on the first floor versus the same task on higher floors that will be more labor intensive and therefore need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the BIM shall be broken down by their location (proximity in the structure) as well as the complexity of its installation.

6.4.2.2. At all design stages it shall be understood that BIM output as described in this document will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the project based on the design. An example of this would be plumbing that is less than 1.5" diameter and therefore not expected to be modeled due to granularity; this information is commonly referred to as The Gap. Quantities from The Gap and their associated costs shall be included in the final project actual cost estimates as well.

End of Section 01 33 16.DS 01

**SECTION 01 45 04.00 10.DS 01
CONTRACTOR QUALITY CONTROL**

1.0 GENERAL

2.0 PRODUCTS (NOT APPLICABLE)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.2. QUALITY CONTROL PLAN

3.4. QUALITY CONTROL ORGANIZATION

3.7. TESTS

1.0 GENERAL

This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 45 04.00 10 apply to this task order, except as otherwise specified herein.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

If this is a construction only task order, delete all references to design quality control.

3.2. QUALITY CONTROL PLAN

If this is a construction only task order, delete all references to design quality control plan.

3.4. QUALITY CONTROL ORGANIZATION

3.4.1. If this is a construction only task order, then the requirements for a design Quality Manager are not applicable to this task order.

3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, a graduate of construction management. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Manager, if qualified and if allowed by Section 00 73 00). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

3.7. TESTS

3.7.4. Furnishing or Transportation of Samples for Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

- For delivery by mail:
 - As directed by the Contracting Officer's Rep
 - As directed
 - As Directed by the Contracting Officer's Rep
 - As Directed by the Contracting Officer's Rep
- For other deliveries:
 - As directed by the Contracting Officer's Rep
 - As directed
 - As directed by the Contracting Officer's Rep
 - As directed by the Contracting Officer's Rep

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

End of Section 01 45 04.00 10.DS 01

**SECTION 01 50 02.DS 01
TEMPORARY CONSTRUCTION FACILITIES**

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.1.1. This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 50 02 apply to this task order, except as otherwise specified herein.

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1. Bulletin Board (As Specified in Base contract)

1.3.2. Project and Safety Signs (Added to Stress standardization of signs, in the event that the Base ID/IQ Section 01 50 02 does not contain this information)

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try <http://www.usace.army.mil/publications/eng-pamphlets/ep310-1-6a/s-16.pdf>.

End of Section 01 50 02.DS 01

SECTION 01 57 23.00 10**STORM WATER POLLUTION PREVENTION MEASURES****PART 1 GENERAL****1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439	(2004) Geosynthetics
ASTM D 4491	(1999a) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 2003)) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999a) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(2002) Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01 57 20.00 10 - ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit. For work in Texas, the Contractor shall meet the requirements of Section 01 57 24 STORM WATER POLLUTION PLAN.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Mill Certificate or Affidavit.

Certificate attesting that the Contractor has met all specified requirements.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include temporary seeding and mulching. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have permanently ceased.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices.

1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Final removal of silt fence barriers shall be upon approval by the Contracting Officer.

1.4.2.2 Straw Bales

The Contractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in a area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage area). Areas where straw bales are to be used are shown on the drawings. Final removal of straw bale barriers shall be upon approval by the Contracting Officer. Rows of bales of straw shall be provided as follows:

- a. Along the downhill perimeter edge of all areas disturbed.

- b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
- c. Along the toe of all cut slopes and fill slopes of the construction areas.
- d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced a maximum of 30 meters apart.
- e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced a maximum of 30 meters apart.
- f. At the entrance to culverts that receive runoff from disturbed areas.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments, which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six (6) months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile Elongation (%)	ASTM D 4632	100 lbs. min. 30 % max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 1.5 m (5 feet). Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.2 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have minimum dimensions of 2 inches x 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inches overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4 inches by 4 inches trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3.2 INSTALLATION OF STRAW BALES

Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

3.3 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

3.3.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade.

3.3.2 Straw Bale Maintenance

Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade.

3.4 INSPECTIONS

3.4.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inch or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

3.4.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.4.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection,

major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.4.4 Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

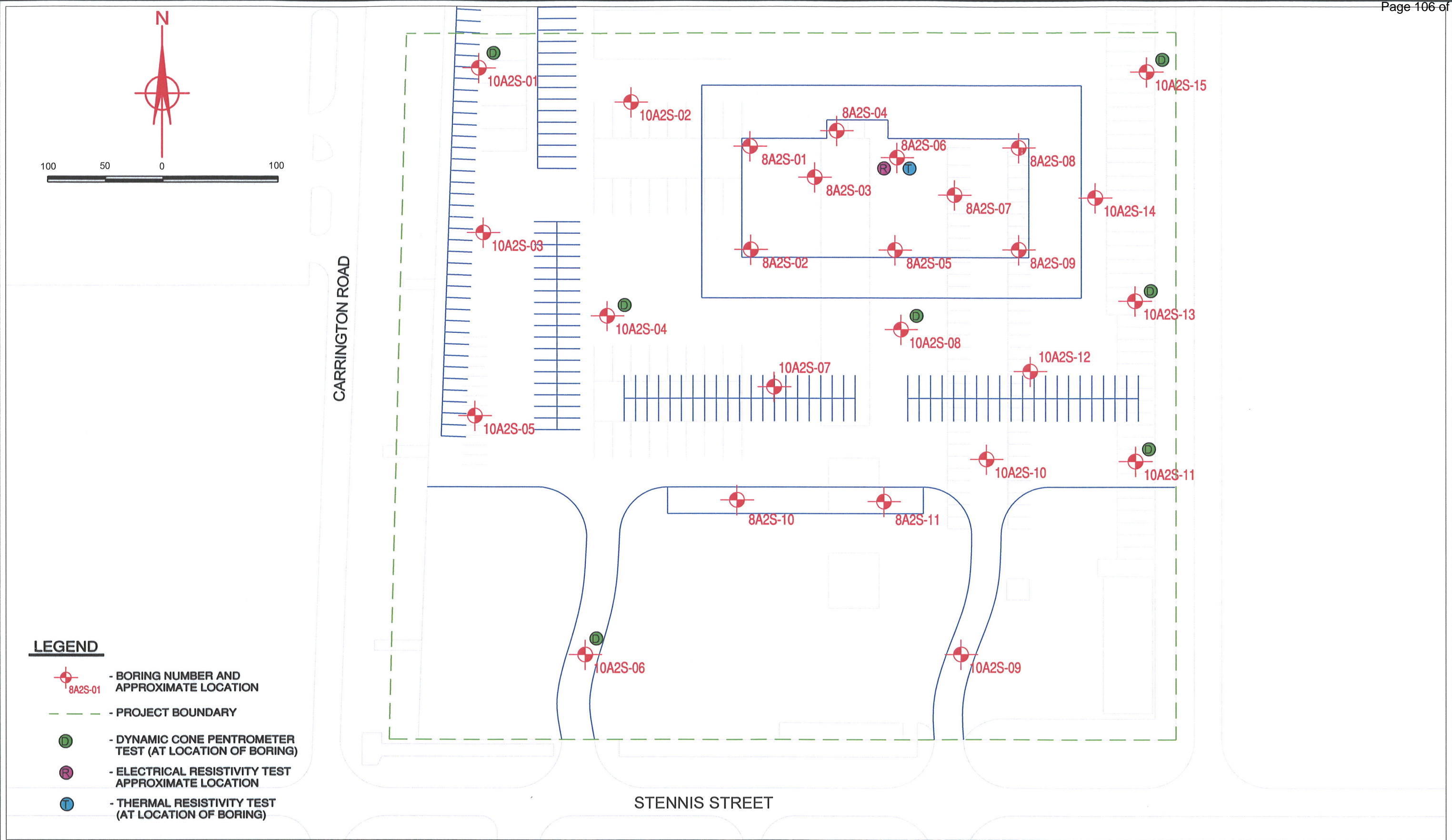
On the first working day of each month the Contractor shall complete, sign, and submit the original form to the State of Texas, Office of Pollution Control (OPC). On the first working day of each month the Contractor shall also furnish one copy of the form submitted to the OPC to the Contracting Officer as part of the Contractor's daily CQC Report and attach a copy of the completed form to the Plan. Unless otherwise notified by the OPC, the Contractor shall submit the Monthly Inspection Report and Certification Forms for an additional two months after the final completion of all storm water pollution prevention measures required in this contract have been implemented.

-- End Of Section --

APPENDIX A

GEOTECHNICAL INFORMATION

SUSTAINMENT BRIGADE



DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817411; W 106.411968				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.9		CONCRETE (11 inches)					
	2.5		LEAN CLAY (CL) brown, moist	Grab Sample			0.9 2.5	
			CLAYEY SAND (SC) loose to medium dense, dark brown to dark tan, moist	8		2.5 4.0	SPT = 4-3-5 LL = 24; PI = 11 %-200 = 26	
			- with calcareous material below 5 feet	24		5.0 6.5	SPT = 5-10-14	
				22		7.5 9.0	SPT = 10-13-9 LL = 30; PI = 14 %-200 = 20	
	10.0							
			POORLY GRADED SAND (SP) medium dense to dense, light brown, slightly moist	24	83	10.0 11.5	SPT = 8-12-12 Non-Plastic	
				30	78	12.5 14.0	SPT = 8-14-16 Non-Plastic	
				38	100	15.0 16.5	SPT = 10-18-20 Non-Plastic %-200 = 4	
			- very dense below 18 feet	82/ 11"	83	18.5 20.0	SPT = 18-34-48/ 5" Non-Plastic	
	20.0							
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817233; W 106.412				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 8		DISTURBED 0		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 25-Sep-09 COMPLETED 25-Sep-09				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
	2.5		LEAN CLAY (CL) brown, moist	Grab Sample		0.8 2.5		
	7.0		CLAYEY SAND (SC) loose to medium dense, dark beige, moist with trace gravel and calcareous material	9	100	2.5 4.0	SPT = 4-4-5	
				17	100	5.0 6.5	SPT = 6-8-9 LL = 32; PI = 12 %-200 = 29	
	10.0		SILTY SAND (SM) medium dense, light brown, slightly moist, with some gravel	20	100	7.5 9.0	SPT = 6-9-11	
			POORLY GRADED SAND (SP) medium dense to dense, light brown, slightly moist, with trace gravel	19	56	10.0 11.5	SPT = 8-9-10 Non-Plastic %-200 = 3	
				38	78	12.5 14.0	SPT = 10-16-22 Non-Plastic	
				66	100	15.0 16.5	SPT = 13-27-36 Non-Plastic	
			- very dense below 15 feet					
	20.0			71	100	18.5 20.0	SPT = 21-28-43 Non-Plastic	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817351; W 106.41183				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 25-Sep-09 COMPLETED 25-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.5		LEAN CLAY (CL) stiff, brown, moist	Grab Sample		0.7 2.5		
			CLAYEY SAND (SC) medium dense, light brown, moist	22	100	2.5 4.0	SPT = 5-9-13 LL = 29; PI = 16 %-200 = 39	
			- dense 5 to 6.5 feet	41	89	5.0 6.5	SPT = 9-12-29 LL = 33; PI = 13 %-200 = 25	
				15	67	7.5 9.0	SPT = 10-7-8	
	10.0		POORLY GRADED SAND (SP) medium dense to dense, light brown, moist, with trace gravel	16	67	10.0 11.5	SPT = 7-7-9 Non-Plastic	
				31	89	12.5 14.0	SPT = 8-11-20 Non-Plastic	
				47	72	15.0 16.5	SPT = 10-20-27 Non-Plastic	
			- very dense 18.5 to 20 feet	80/ 11"		18.5 20.0	SPT = 30-50/ 5" Non-Plastic	
	20.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.81745; W 106.411717				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 25-Sep-09 COMPLETED 25-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	3.0		LEAN CLAY (CL) brown, moist	Grab Sample		0.7 2.5		
			CLAYEY SAND (SC) loose to medium dense, light brown, moist with calcareous material	9	67	2.5 4.0	SPT = 5-5-4 LL = 40; PI = 27 %-200 = 40	
				20	94	4.5 6.0	SPT = 4-10-10	
				16	89	7.5 9.0	SPT = 6-8-8	
	10.0		POORLY GRADED SAND (SP) medium dense to dense, light brown, slightly moist, with some gravel	18	72	10.0 11.5	SPT = 7-8-10 Non-Plastic %-200 = 3	
				42	83	12.5 14.0	SPT = 11-18-24 Non-Plastic	
			- very dense below 15 feet	68	100	15.0 16.5	SPT = 18-28-40 Non-Plastic	
				79/ 11"	72	18.5 20.0	SPT = 21-44-35/ 5" Non-Plastic	
	20.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817217; W 106.411532				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 8		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 28-Sep-09 COMPLETED 28-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.9		CONCRETE (11 inches)					
	3.0		LEAN CLAY (CL) brown, moist	Grab Sample		0.9 2.5		
			CLAYEY SAND (SC) dense, dark biege, moist with calcareous material	49	67	2.5 4.0	SPT= 3-28-21	
	7.0		- medium dense below 5 feet	15	100	4.5 6.0	SPT= 12-9-6	
			POORLY GRADED SAND (SP) medium dense to dense, light brown, slightly moist, with trace gravel	27	67	7.5 9.0	SPT= 8-12-15 Non-Plastic	
			- very dense below 12 1/2 feet	36	78	10.0 11.5	SPT= 8-16-20 Non-Plastic	
				70	72	12.5 14.0	SPT= 15-32-38 Non-Plastic	
				74	100	15.0 16.5	SPT= 19-29-45 Non-Plastic	
				73	100	18.5 20.0	SPT= 16-31-42 Non-Plastic	
	20.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 2 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.81741; W 106.411536				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 25-Sep-09 COMPLETED 25-Sep-09				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	1.0		CONCRETE (12 inches)					
	2.5		LEAN CLAY (CL) brown, moist	Grab Sample		1.0 2.5		
	7.0		CLAYEY SAND (SC) medium dense to dense, dark beige, moist with calcareous material	11	61	2.5 4.0	SPT= 4-5-6 LL = 31; PI = 17 %-200 = 26	
				33	78	4.5 6.0	SPT= 5-11-22	
	11.0		SILTY SAND (SM) medium dense, light brown, moist with calcareous material	16	72	7.5 9.0	SPT= 9-8-8 Non-Plastic	
				19	33	10.0 11.5	SPT= 5-7-12 Non-Plastic	
			POORLY GRADED SAND (SP) very dense, light brown, slightly moist, with some gravel	60	78	12.5 14.0	SPT= 17-26-34 Non-Plastic	
				67		15.0 16.5	SPT= 13-26-41 Non-Plastic	
	20.0			78	94	18.5 20.0	SPT= 26-41-37 Non-Plastic	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees. (continues)					

DRILLING LOG (Cont Sheet)			ELEVATION TOP OF HOLE (ft)		Hole No. 8A2S-06											
PROJECT Main Cantonment - Sustainment Brigade Facility				INSTALLATION Fort Worth District				SHEET 2 OF 2 SHEETS								
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i								
			4. Surface resistivity measurements per ASTM G57: $r=191.5aR$, where r is soil resistivity (ohms-cm), a is spacing (feet) and R is measured resistance (ohms): <table> <tr> <td>a</td> <td>r</td> </tr> <tr> <td>1</td> <td>1,264</td> </tr> <tr> <td>2.5</td> <td>2,585</td> </tr> <tr> <td>5</td> <td>2,490</td> </tr> </table>	a	r	1	1,264	2.5	2,585	5	2,490					
a	r															
1	1,264															
2.5	2,585															
5	2,490															

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.81735; W 106.4114				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 25-Sep-09 COMPLETED 25-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.0		LEAN CLAY (CL) brown, moist	Grab Sample			0.7 2.5	
			CLAYEY SAND (SC) medium dense, beige, moist with calcareous material	22			2.5 4.0	SPT= 3-4-18 LL = 32; PI = 18 %-200 = 43
				11	56		5.0 6.5	SPT= 13-7-4 LL = 29; PI = 9 %-200 = 33
	8.0							
				14			7.5 9.0	SPT= 4-6-8
			POORLY GRADED SAND (SP) dense, light brown, slightly moist, with some fine gravel	36	89		10.0 11.5	SPT= 9-16-20 Non-Plastic
				33	89		12.5 14.0	SPT= 8-15-18 Non-Plastic
				53	100		14.5 16.0	SPT= 16-22-31 Non-Plastic
				88	78		18.5 20.0	SPT= 12-38-50 Non-Plastic %-200 = 5
	20.0							
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.81725; W 106.4112				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE 28-Sep-09		STARTED 28-Sep-09		COMPLETED 28-Sep-09
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (9 inches)					
	2.5		LEAN CLAY (CL) stiff, brown, moist	10	86	0.8 2.5	SPT= 4-4-6 LL = 27; PI = 14 %-200 = 57	
	7.5		CLAYEY SAND (SC) medium dense to loose, brown, slightly moist - with calcareous material below 5 feet - black with some gravel 6 to 7.5 feet	12 7	100 56	2.5 4.0 5.0 6.5	SPT= 3-4-9 LL = 30; PI = 16 %-200 = 48 SPT= 3-3-4 LL = 25; PI = 12 %-200 = 27	
	12.0		SILTY SAND (SM) loose, light brown, slightly moist, with calcareous material	11 13	89 72	7.5 9.0 10.0 11.5	SPT= 5-6-5 Non-Plastic SPT= 4-6-7 Non-Plastic	
	20.0		POORLY GRADED SAND (SP) dense, light brown, slightly moist, with trace fine gravel - very dense below 14 feet	41 77 70	89 100 100	12.5 14.0 15.0 16.5 18.5 20.0	SPT= 8-19-32 Non-Plastic SPT= 17-26-51 Non-Plastic SPT= 24-34-36 Non-Plastic	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817233; W 106.41135				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.5		LEAN CLAY (CL) brown, moist	Grab Sample		0.7 2.5		
	4.0		SANDY LEAN CLAY (CL) very stiff, brown, moist	16	100	2.5 4.0	SPT= 3-7-9 LL = 33; PI = 19 %-200 = 57	
	10.0		SILTY SAND (SM) medium dense, brown, slightly moist - black 6 to 7 feet - light brown with calcareous material below 7 feet	24	78	5.0 6.5	SPT= 10-13-11	
				19		7.5 9.0	SPT= 8-10-9	
				27	78	10.0 11.5	SPT= 10-13-14 Non-Plastic	
				49	89	12.5 14.0	SPT= 12-20-29 Non-Plastic	
				77	100	15.0 16.5	SPT= 28-29-38 Non-Plastic	
	20.0		POORLY GRADED SAND (SP) medium dense to dense, slightly moist, light brown, with gravel - very dense below 15 feet	78/ 10"	100	18.5 20.0	SPT= 22-38-40/ 4" Non-Plastic	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816621; W 106.412079				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-10				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 28-Sep-09 COMPLETED 28-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
			CLAYEY SAND (SC) medium dense to loose, brown, moist, with trace fine gravel	Grab Sample	90	0.8 2.5	SPT= 3-4-6	
			- black from 3 to 4 feet	5	89	2.5 4.0	SPT= 5-2-3 LL = 26; PI = 11 %-200 = 26	
			- very loose 5 to 6.5 feet	3	78	5.0 6.5	SPT= 2-2-1	
			- dense below 10 feet	29	72	7.5 9.0	SPT= 12-14-15	
				34	67	10.0 11.5	SPT= 15-14-20 LL = 28; PI = 15 %-200 = 29	
	12.0		POORLY GRADED SAND (SP) dense to very dense, slightly moist, light brown, with trace gravel	34	72	12.5 14.0	SPT= 10-15-19 Non-Plastic	
				53	78	15.0 16.5	SPT= 18-25-28 Non-Plastic	
				68	100	18.5 20.0	SPT= 18-28-40 Non-Plastic	
	20.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816627; W 106.411584				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-11				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Sergio Gijon				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 28-Sep-09 COMPLETED 28-Sep-09				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.5		LEAN CLAY (CL) brown, moist	Grab Sample		0.7 2.5		
	9.5		CLAYEY SAND (SC) loose to medium dense, brown to dark brown, moist	7		2.5 4.0	SPT= 3-2-5 LL = 34; PI = 20 %-200 = 47	
			- with organic matter 5 to 6 feet	15	100	5.0 6.5	SPT= 11-9-6 LL = 26; PI = 13 %-200 = 38	
			- with calcareous material below 7.5 feet	20	67	7.5 9.0	SPT= 12-10-10	
	11.5		SILTY SAND (SM) medium dense, light brown, slightly moist, with some gravel	18	67	10.0 11.5	SPT= 6-8-10 Non-Plastic	
			POORLY GRADED SAND (SP) dense, slightly moist, with trace fine gravel	42	89	12.5 14.0	SPT= 10-17-25 Non-Plastic	
				70	89	15.0 16.5	SPT= 16-26-44 Non-Plastic %-200 = 3	
				55	94	18.5 20.0	SPT= 21-27-28 Non-Plastic	
	20.0		Boring Terminated					
NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817616; W 106.412663				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (9 inches)					
	3.0		SILTY SAND (SM) medium dense, brown, slightly moist	Grab Sample		0.8 2.5		
			CLAYEY SAND (SC) medium dense to dense, dark beige, moist with calcareous material	10	128	2.5 4.0	SPT= 4-5-5	
	8.0			36	100	5.0 6.5	SPT= 7-6-30	
	10.0		POORLY GRADED SAND (SP) medium dense, light brown, moist, with some fine gravel	15	94	8.5 10.0	SPT= 7-7-8 Non-Plastic	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817533; W 106.412383				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	1.0		CONCRETE (12 inches)					
	2.5		SILTY SAND (SM) loose, black, moist with calcareous material	Grab Sample		1.0 2.5	SPT= 4-3-4 Non-Plastic %-200 = 20	
			CLAYEY SAND (SC) medium dense, dark beige, moist	11		2.5 4.0	SPT= 3-3-8 LL = 30; PI = 17 %-200 = 28	
				27		5.0 6.5	SPT= 7-9-18	
				14		8.5 10.0	SPT= 9-7-7	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817233; W 106.41265				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.0		SILTY SAND (SM) loose, black to light brown, moist	Grab Sample	73	0.7 2.5	SPT= 3-4-3	
			CLAYEY SAND (SC) calcareous, loose to medium dense, dark beige, moist	7	67	2.5 4.0	SPT= 4-3-4	
				18	72	5.0 6.5	SPT= 10-8-10	
	8.0		POORLY GRADED SAND (SP) medium dense, light brown, moist, with trace gravel	20	72	8.5 10.0	SPT= 8-9-11 Non-Plastic	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817; W 106.41235				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (9 inches)					
			CLAYEY SAND (SC) loose to very loose, dark brown to red-brown, moist, with some fine gravel	Grab Sample	86	0.8 2.5	SPT= 6-6-4	
				10	89	2.5 4.0	SPT= 3-4-6	
				3		5.0 6.5	SPT= 3-1-2	
	8.0		SILTY SAND (SM) medium dense, light brown, slightly moist	11	67	8.5 10.0	SPT= 6-5-5 %-200 = 19	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.81675; W 106.412617				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
			SILTY SAND (SM) medium dense, brown, moist, with trace calcareous material	Grab Sample	82	0.7 2.5	SPT= 5-6-5	
				13	100	2.5 4.0	SPT= 3-5-8	
	4.5		CLAYEY SAND (SC) medium dense, light brown, moist, with trace calcareous material	15	89	5.0 6.5	SPT= 6-8-7	
	8.5		SILTY SAND (SM) medium dense, light brown, moist	12	72	8.5 10.0	SPT= 6-7-5	
	10.0							
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816267; W 106.412483				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
			CLAYEY SAND (SC) loose to medium dense, light brown, moist, with calcareous material	5		0.7 2.2	SPT= 2-3-2	
				20	67	2.5 4.0	SPT= 5-8-12	
				16		5.0 6.5	SPT= 11-10-6	
			- with gravel below 8.5 feet	15		8.5 10.0	SPT= 7-8-7 LL = 21; PI = 8 %-200 = 24	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816868; W 106.411886				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.7		CONCRETE (8 inches)					
	2.5		LEAN CLAY (CL) stiff, brown, moist	9		0.7 2.2	SPT= 3-4-5	
			CLAYEY SAND (SC) medium dense to loose, brown, moist, with trace calcareous material	13		2.5 4.0	SPT= 6-7-6 LL = 36; PI = 23 %-200 = 47	
				9		5.0 6.5	SPT= 4-4-5	
	8.5		SANDY LEAN CLAY (CL) very stiff, light brown, slightly moist with trace gravel	27		8.5 10.0	SPT= 13-13-14 %-200 = 55	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817033; W 106.411483				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 29-Sep-09 COMPLETED 29-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
	2.0		SANDY LEAN CLAY firm, moist, brown	5		0.8 2.3	SPT= 2-3-2	
			CLAYEY SAND (SC) very dense, moist, with calcareous material	76	50	2.5 4.0	SPT= 14-36-40	
			- medium dense below 5 feet	20		5.0 6.5	SPT= 12-10-10 LL = 42; PI = 21 %-200 = 26	
	8.0		SANDY LEAN CLAY (CL) hard, light brown, slightly moist	31	72	8.5 10.0	SPT= 9-15-16 LL = 37; PI = 23 %-200 = 54	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816254; W 106.411371				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
	3.0		FILL: CLAYEY SAND (SC) loose to medium dense, light brown, moist, with calcareous material and glass fragments	6		0.8 2.3	SPT= 2-4-2	
			CLAYEY SAND (SC) medium dense, light brown, moist, with calcareous material	14		2.5 4.0	SPT= 7-8-6	
	7.5		POORLY GRADED SAND (SP) medium dense, light brown, slightly moist, with gravel	10		5.0 6.5	SPT= 5-2-8	
	10.0			18		8.5 10.0	SPT= 9-10-8	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816767; W 106.4113				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-10				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 29-Sep-09		COMPLETED 29-Sep-09
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
			FILL: LEAN CLAY (CL) stiff, brown, moist	10	94	0.8 2.3	SPT= 5-6-4	
			- soft 2.5 to 4 feet	3	83	2.5 4.0	SPT= 1-1-2	
	4.5		FILL: CLAYEY SAND (SC) loose, brown, moist, with some calcareous material					
	6.5		- rubber and glass fragments 5 to 6.5 feet	10		5.0 6.5	SPT= 6-6-4	
			CLAYEY SAND (SC) loose to medium dense, brown, moist, with some calcareous material					
	10.0		- with gravel 8. 5 to 10 feet	22	67	8.5 10.0	SPT= 10-12-10 LL = 33; PI = 20 %-200 = 42	
Boring Terminated								
NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816783; W 106.410917				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-11				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
			CLAYEY SAND (SC) loose to medium dense, light brown, slightly moist, with calcareous material	7		0.8 2.3	SPT= 5-4-3	
				12		2.5 4.0	SPT= 5-6-6 LL = 38; PI = 24 %-200 = 24	
			- very dense 5 to 6.5 feet	52		5.0 6.5	SPT= 13-26-26	
				14		8.5 10.0	SPT= 7-7-7 LL = 31; PI = 20 %-200 = 28	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.816967; W 106.411133				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-12				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	1.0		CONCRETE (12 inches)					
	3.0		SANDY LEAN CLAY (CL) soft, brown, moist	3	67	1.0 2.5	SPT= 3-2-1	
				19		2.5 4.0	SPT= 8-11-8	
	7.5		SILTY SAND (SM) medium dense, brown, moist, with lean clay pockets - dark brown 5 to 7 feet	14		5.0 6.5	SPT= 3-3-11 Non-Plastic	
	10.0		POORLY GRADED SAND (SP) medium dense, light brown, slightly moist	16		8.5 10.0	SPT= 7-8-8 Non-Plastic %-200 = 5	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					































DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817067; W 106.410883				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-13				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
	2.0		SILTY SAND (SM) medium dense, brown, moist, with some clay	12		0.8 2.3	SPT= 5-8-4	
			CLAYEY SAND (SC) medium dense, brown, moist, with calcareous material	11		2.5 4.0	SPT= 4-6-5	
				13		5.0 6.5	SPT= 6-6-7	
	8.0		SILTY SAND (SM) medium dense, light brown, moist, with traces of gravel	15		8.5 10.0	SPT= 8-7-8	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817317; W 106.411				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-14				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	1.0		CONCRETE (10 inches)					
	4.5		CLAYEY SAND (SC) loose to medium dense, brown, moist	8		1.0 2.5	SPT= 3-5-3	
	7.5		SILTY SAND (SM) medium dense, brown, moist	18		2.5 4.0	SPT= 5-11-7	
	10.0		CLAYEY SAND (SC) dense, light brown, moist	20		5.0 6.5	SPT= 4-10-10	
				33		8.5 10.0	SPT= 8-14-17 LL = 33; PI = 19 %-200 = 34	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								











DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT Main Cantonment - Sustainment Brigade Facility				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss; N 31.817567; W 106.410867				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-15				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 30-Sep-09 COMPLETED 30-Sep-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) 0 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.8		CONCRETE (10 inches)					
	2.0		FILL: CLAYEY SAND (SC) medium dense, brown, moist	14		0.8 2.3	SPT= 4-6-8	
			FILL: SILTY SAND (SM) medium dense, light brown, moist, with trace clay	20		2.5 4.0	SPT= 4-11-9	
				5		5.0 6.5	SPT= 6-3-2	
	7.0		- with asphalt and glass fragments 6 to 7 feet					
			CLAYEY SAND (SC) medium dense, beige, moist, with calcareous material					
	10.0			16		8.5 10.0	SPT= 9-8-8 LL = 21; PI = 9 %-200 = 18	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

KEY TO TERMS AND SYMBOLS












MATERIAL TYPES

SOIL TERMS		ROCK TERMS		OTHER					
	CALCAREOUS		PEAT		CHALK		LIMESTONE		ASPHALT
	CALICHE		SAND		CLAYSTONE		MARL		BASE
	CLAY		SANDY		CLAY-SHALE		METAMORPHIC		CONCRETE/CEMENT
	CLAYEY		SILT		CONGLOMERATE		SANDSTONE		BRICKS / PAVERS
	GRAVEL		SILTY		DOLOMITE		SHALE		WASTE
	GRAVELLY		FILL		IGNEOUS		SILTSTONE		NO INFORMATION






WELL CONSTRUCTION AND PLUGGING MATERIALS

	BLANK PIPE		BENTONITE		BENTONITE & CUTTINGS		CUTTINGS		SAND
	SCREEN		CEMENT GROUT		CONCRETE/CEMENT		GRAVEL		VOLCLAY

SAMPLE TYPES

	AIR ROTARY		MUD ROTARY		SHELBY TUBE
	GRAB SAMPLE		NO RECOVERY		SPLIT BARREL
	CORE		NX CORE		SPLIT SPOON
	GEOPROBE SAMPLER		TEXAS CONE PENETROMETER		

STRENGTH TEST TYPES

	POCKET PENETROMETER
	TORVANE
	UNCONFINED COMPRESSION
	TRIAxIAL COMPRESSION UNCONSOLIDATED-UNDRAINED
	TRIAxIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT
SHEAR STRENGTHS UNLESS OTHERWISE NOTED

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

COHESIVE STRENGTH

PLASTICITY

<u>Penetration Resistance Blows per ft</u>	<u>Relative Density</u>	<u>Resistance Blows per ft</u>	<u>Consistency</u>	<u>Cohesion TSF</u>	<u>Plasticity Index</u>	<u>Degree of Plasticity</u>
0 - 4	Very Loose	0 - 2	Very Soft	0 - 0.125	0 - 5	None
4 - 10	Loose	2 - 4	Soft	0.125 - 0.25	5 - 10	Low
10 - 30	Medium Dense	4 - 8	Firm	0.25 - 0.5	10 - 20	Moderate
30 - 50	Dense	8 - 15	Stiff	0.5 - 1.0	20 - 40	Plastic
> 50	Very Dense	15 - 30	Very Stiff	1.0 - 2.0	> 40	Highly Plastic
		> 30	Hard	> 2.0		

ABBREVIATIONS

B = Benzene	Qam, Qas, Qal = Quaternary Alluvium	Kef = Eagle Ford Shale
T = Toluene	Qat = Low Terrace Deposits	Kbu = Buda Limestone
E = Ethylbenzene	Qbc = Beaumont Formation	Kdr = Del Rio Clay
X = Total Xylenes	Qt = Fluvial Terrace Deposits	Kft = Fort Terrett Member
BTEX = Total BTEX	Qao = Seymour Formation	Kgt = Georgetown Formation
TPH = Total Petroleum Hydrocarbons	Qle = Leona Formation	Kep = Person Formation
ND = Not Detected	Q-Tu = Uvalde Gravel	Kek = Kainer Formation
NA = Not Analyzed	Ewi = Wilcox Formation	Kes = Escondido Formation
NR = Not Recorded/No Recovery	Emi = Midway Group	Kew = Walnut Formation
OVA = Organic Vapor Analyzer	Mc = Catahoula Formation	Kgr = Glen Rose Formation
ppm = Parts Per Million	EI = Laredo Formation	Kgru = Upper Glen Rose Formation
	Kknm = Navarro Group and Marlbrook Marl	Kgrl = Lower Glen Rose Formation
	Kpg = Pecan Gap Chalk	Kh = Hensell Sand
	Kau = Austin Chalk	

PROJECT NO. AEA09-059-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARRELL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Main Cantonment - Sustainment Brigade Facility
 Stennis Street at Carrington Road
 Fort Bliss, Texas

FILE NAME: AEA09-059-00 SBF.GPJ

10/27/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
8A2S-01	0.9 to 2.5										
	2.5 to 4.0	8	10	24	13	11	SC		26		
	5.0 to 6.5	24									
	7.5 to 9.0	22	12	30	16	14	SC		20		
	10.0 to 11.5	24				NP					
	12.5 to 14.0	30				NP					
	15.0 to 16.5	38	3			NP	SP		4		
	18.5 to 20.0	82/ 11"				NP					
8A2S-02	0.8 to 2.5										
	2.5 to 4.0	9									
	5.0 to 6.5	17	13	32	20	12	SC		29		
	7.5 to 9.0	20									
	10.0 to 11.5	19	3			NP	SP		3		
	12.5 to 14.0	38				NP					
	15.0 to 16.5	66				NP					
	18.5 to 20.0	71				NP					
8A2S-03	0.7 to 2.5										
	2.5 to 4.0	22	15	29	13	16	SC		39		
	5.0 to 6.5	41	13	33	20	13	SC		25		
	7.5 to 9.0	15									
	10.0 to 11.5	16				NP					
	12.5 to 14.0	31				NP					
	15.0 to 16.5	47				NP					
	18.5 to 20.0	80/ 11"				NP					
8A2S-04	0.7 to 2.5										
	2.5 to 4.0	9	19	40	13	27	SC		40		
	4.5 to 6.0	20									
	5.0		12	28	18	10	SC		29		
	7.5 to 9.0	16									
	10.0 to 11.5	18	3			NP	SP		3		
	12.5 to 14.0	42				NP					
	15.0 to 16.5	68				NP					
8A2S-05	18.5 to 20.0	79/ 11"				NP					
	0.9 to 2.5										
	2.5 to 4.0	49									
	4.5 to 6.0	15									
	5.0		16	33	22	11	SC		30		
	7.5 to 9.0	27				NP					
	10.0 to 11.5	36				NP					

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AEA09-059-00

Raba-KistnerFriday, February 19, 2010
FIGURE 29a

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Main Cantonment - Sustainment Brigade Facility
Stennis Street at Carrington Road
Fort Bliss, Texas

FILE NAME: AEA09-059-00 SBF.GPJ

10/27/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
8A2S-05	12.5 to 14.0	70				NP					
	15.0 to 16.5	74				NP					
	18.5 to 20.0	73				NP					
8A2S-06	1.0 to 2.5										
	2.5 to 4.0	11	15	31	14	17	SC		26		
	4.5 to 6.0	33									
	7.5 to 9.0	16				NP					
	10.0 to 11.5	19				NP					
	12.5 to 14.0	60				NP					
	15.0 to 16.5	67				NP					
	18.5 to 20.0	78				NP					
8A2S-07	0.7 to 2.5										
	2.5 to 4.0	22	17	32	14	18	SC		43		
	5.0 to 6.5	11	15	29	20	9	SC		33		
	7.5 to 9.0	14									
	10.0 to 11.5	36				NP					
	12.5 to 14.0	33				NP					
	14.5 to 16.0	53				NP					
	18.5 to 20.0	88	2			NP	SP		5		
8A2S-08	0.8 to 2.5	10	19	27	13	14	CL		57		
	2.5 to 4.0	12	18	30	14	16	SC		48		
	5.0 to 6.5	7	11	25	13	12	SC		27		
	7.5 to 9.0	11				NP					
	10.0 to 11.5	13				NP					
	12.5 to 14.0	41				NP					
	15.0 to 16.5	77				NP					
	18.5 to 20.0	70				NP					
8A2S-09	0.7 to 2.5										
	2.5 to 4.0	16	20	33	14	19	CL		57		
	5.0 to 6.5	24									
	7.5 to 9.0	19									
	10.0 to 11.5	27				NP					
	12.5 to 14.0	49				NP					
	15.0 to 16.5	77				NP					
	18.5 to 20.0	78/ 10"				NP					
8A2S-10	0.8 to 2.5	10									
	2.5 to 4.0	5	14	26	15	11	SC		26		
	5.0 to 6.5	3									
	7.5 to 9.0	29									

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AEA09-059-00

Raba-KistnerFriday, February 19, 2010
FIGURE 296

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Main Cantonment - Sustainment Brigade Facility
Stennis Street at Carrington Road
Fort Bliss, Texas

FILE NAME: AEA09-059-00 SBF.GPJ

10/27/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
8A2S-10	10.0 to 11.5	34	11	28	13	15	SC		29		
	12.5 to 14.0	34				NP					
	15.0 to 16.5	53				NP					
	18.5 to 20.0	68				NP					
8A2S-11	0.7 to 2.5		17	34	14	20	SC		47		
	2.5 to 4.0	7				20	SC		47		
	5.0 to 6.5	15				13	SC		38		
	7.5 to 9.0	20									
	10.0 to 11.5	18				NP					
	12.5 to 14.0	42				NP					
	15.0 to 16.5	70				NP	SP		3		
	18.5 to 20.0	55				NP					
10A2S-01	0.8 to 2.5		11	30	13		SM		20		
	2.5 to 4.0	10									
	5.0 to 6.5	36									
	8.5 to 10.0	15				NP					
10A2S-02	1.0 to 2.5	7	11	30	13	NP	SM		20		
	2.5 to 4.0	11				17	SC		28		
	5.0 to 6.5	27									
	8.5 to 10.0	14									
10A2S-03	0.7 to 2.5	7	9						19		
	2.5 to 4.0	7									
	5.0 to 6.5	18									
	8.5 to 10.0	20				NP					
10A2S-04	0.8 to 2.5	10	9						19		
	2.5 to 4.0	10									
	5.0 to 6.5	3									
	8.5 to 10.0	11									
10A2S-05	0.7 to 2.5	11	11	21	13				24		
	2.5 to 4.0	13									
	5.0 to 6.5	15									
	8.5 to 10.0	12									
10A2S-06	0.0 to 0.7		11	21	13				24		
	0.7 to 2.2	5									
	2.5 to 4.0	20									
	5.0 to 6.5	16									
10A2S-07	8.5 to 10.0	15	11	21	13	8	SC		24		
	0.0 to 0.7										
	0.7 to 2.2	9									

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. AEA09-059-00

Raba-KistnerFriday, February 19, 2010
FIGURE 29c

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Main Cantonment - Sustainment Brigade Facility
Stennis Street at Carrington Road
Fort Bliss, Texas

FILE NAME: AEA09-059-00 SBF.GPJ

10/27/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
10A2S-07	2.5 to 4.0	13	19	36	13	23	SC		47		
	5.0 to 6.5	9									
	8.5 to 10.0	27	16						55		
10A2S-08	0.0 to 0.8										
	0.8 to 2.3	5									
	2.5 to 4.0	76									
10A2S-09	5.0 to 6.5	20	18	42	21	21	SC		26		
	8.5 to 10.0	31	20	37	14	23	CL		54		
	0.0 to 0.8										
10A2S-10	0.8 to 2.3	6									
	2.5 to 4.0	14									
	5.0 to 6.5	10									
10A2S-11	8.5 to 10.0	18									
	0.0 to 0.8										
	0.8 to 2.3	10									
10A2S-12	2.5 to 4.0	3									
	5.0 to 6.5	10									
	8.5 to 10.0	22	17	33	13	20	SC		42		
10A2S-13	0.0 to 0.8										
	0.8 to 2.3	7									
	2.5 to 4.0	12	10	38	14	24	SC		24		
10A2S-14	5.0 to 6.5	52									
	8.5 to 10.0	14	11	31	11	20	SC		28		
	0.0 to 1.0										
10A2S-15	1.0 to 2.5	3									
	2.5 to 4.0	19									
	5.0 to 6.5	14				NP					
10A2S-16	8.5 to 10.0	16	5			NP	SP		5		
	0.0 to 0.8										
	0.8 to 2.3	12									
10A2S-17	2.5 to 4.0	11									
	5.0 to 6.5	13									
	8.5 to 10.0	15									
10A2S-18	0.0 to 1.0										
	1.0 to 2.5	8									
	2.5 to 4.0	18									
10A2S-19	5.0 to 6.5	20									
	8.5 to 10.0	33	14	33	14	19	SC		34		
	0.0 to 0.8										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

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PROJECT NO. AEA09-059-00

Raba-KistnerFriday, February 19, 2010
FIGURE 29d

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Main Cantonment - Sustainment Brigade Facility
Stennis Street at Carrington Road
Fort Bliss, Texas

FILE NAME: AEA09-059-00 SBF.GPJ

10/27/2009

[illegible]

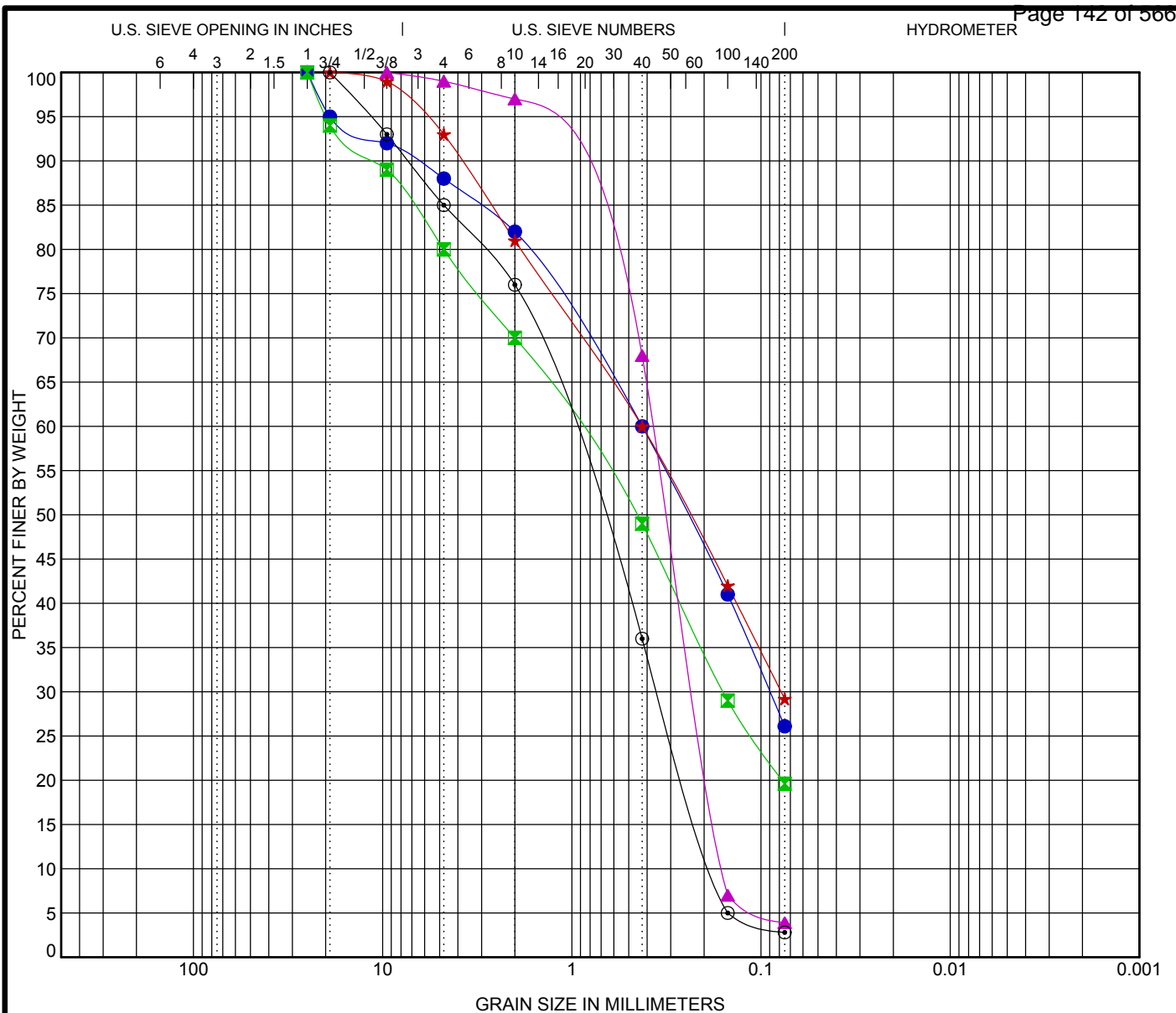
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CU = Consolidated Undrained Triaxial

PROJECT NO. AEA09-059-00

Raba-Kistner

Friday, February 19, 2010
FIGURE 29e



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	8A2S-01	2.5	CLAYEY SAND(SC)			24	13	11		
■	8A2S-01	7.5	CLAYEY SAND with GRAVEL(SC)			30	16	14		
▲	8A2S-01	15.0	POORLY GRADED SAND(SP)					NP	0.84	2.35
★	8A2S-02	5.0	CLAYEY SAND(SC)			32	20	12		
⊙	8A2S-02	10.0	POORLY GRADED SAND with GRAVEL(SP)					NP	0.63	6.07
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	8A2S-01	2.5	25	0.425	0.09		12.0	61.9	26.1	
■	8A2S-01	7.5	25	0.957	0.158		20.0	60.4	19.6	
▲	8A2S-01	15.0	9.5	0.371	0.222	0.158	1.0	95.1	3.9	
★	8A2S-02	5.0	19	0.425	0.078		7.0	63.8	29.2	
⊙	8A2S-02	10.0	19	1.076	0.347	0.177	15.0	82.2	2.8	

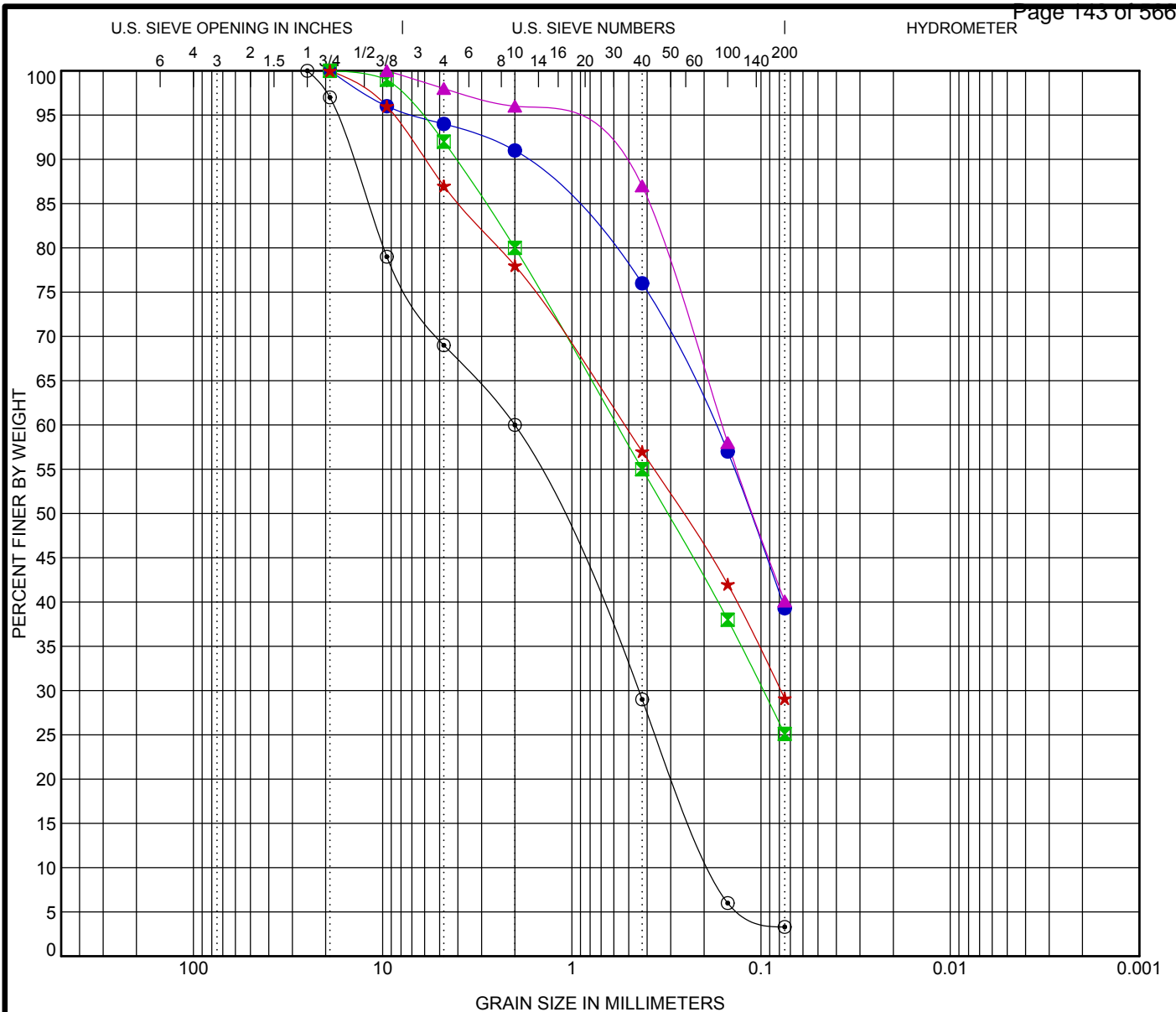


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FIGURE 30



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

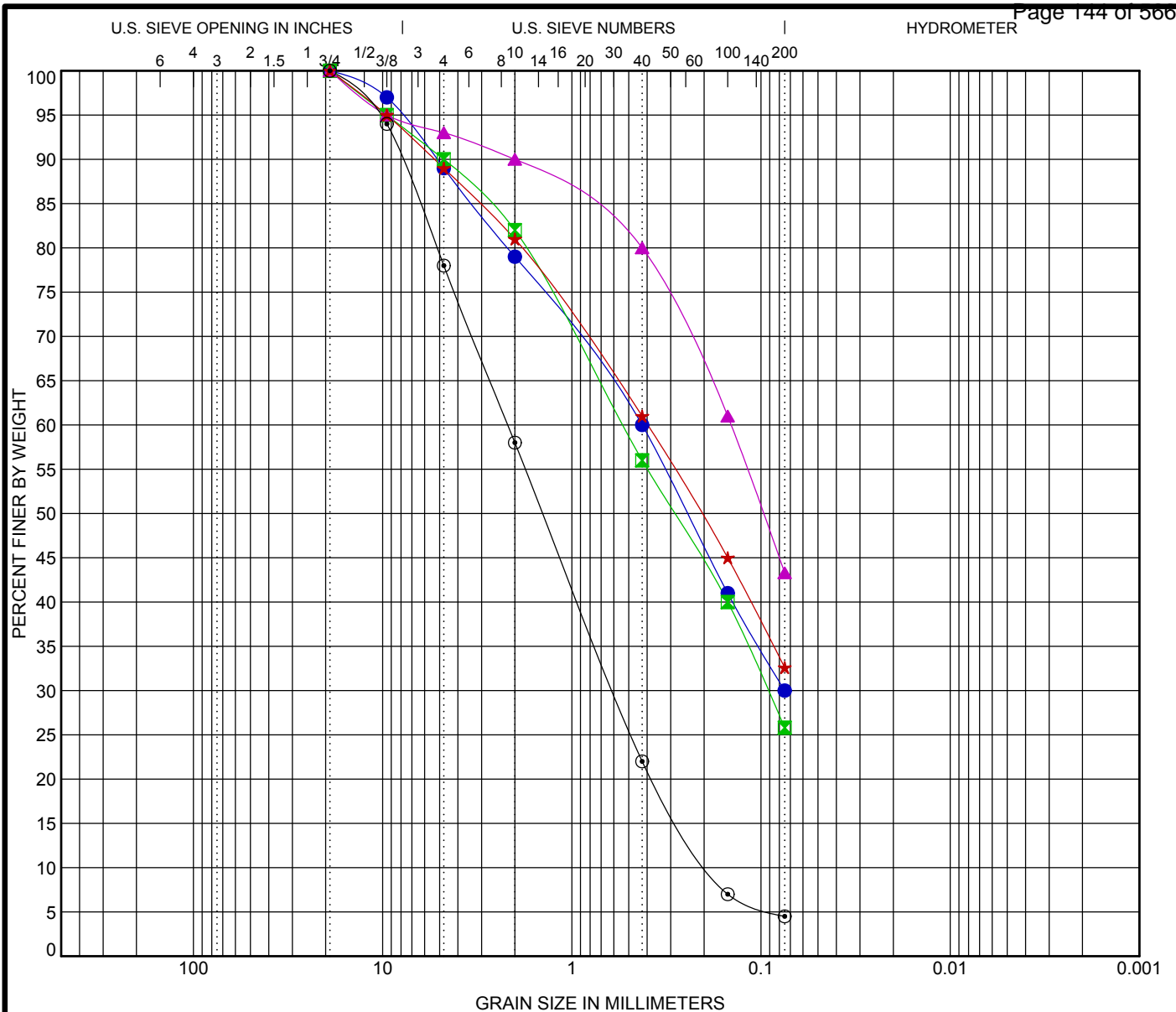
Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	8A2S-03	2.5	CLAYEY SAND(SC)			29	13	16		
■	8A2S-03	5.0	CLAYEY SAND(SC)			33	20	13		
▲	8A2S-04	2.5	CLAYEY SAND(SC)			40	13	27		
★	8A2S-04	5.0	CLAYEY SAND(SC)			28	18	10		
⊙	8A2S-04	10.0	POORLY GRADED SAND with GRAVEL(SP)						NP	0.56 11.12
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	8A2S-03	2.5	19	0.177			6.0	54.7	39.3	
■	8A2S-03	5.0	19	0.579	0.098		8.0	66.9	25.1	
▲	8A2S-04	2.5	9.5	0.161			2.0	57.9	40.1	
★	8A2S-04	5.0	19	0.53	0.079		13.0	57.9	29.1	
⊙	8A2S-04	10.0	25	2	0.447	0.18	31.0	65.7	3.3	



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FIGURE 31



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	8A2S-05	5.0	CLAYEY SAND(SC)			33	22	11		
✕	8A2S-06	2.5	CLAYEY SAND(SC)			31	14	17		
▲	8A2S-07	2.5	CLAYEY SAND(SC)			32	14	18		
★	8A2S-07	5.0	CLAYEY SAND(SC)			29	20	9		
⊙	8A2S-07	18.5	POORLY GRADED SAND with GRAVEL(SP)						NP	0.89 11.80
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	8A2S-05	5.0	19	0.425	0.075		11.0	59.0	30.0	
✕	8A2S-06	2.5	19	0.539	0.092		10.0	64.2	25.8	
▲	8A2S-07	2.5	19	0.144			7.0	49.7	43.3	
★	8A2S-07	5.0	19	0.398			11.0	56.4	32.6	
⊙	8A2S-07	18.5	19	2.181	0.6	0.185	22.0	73.5	4.5	

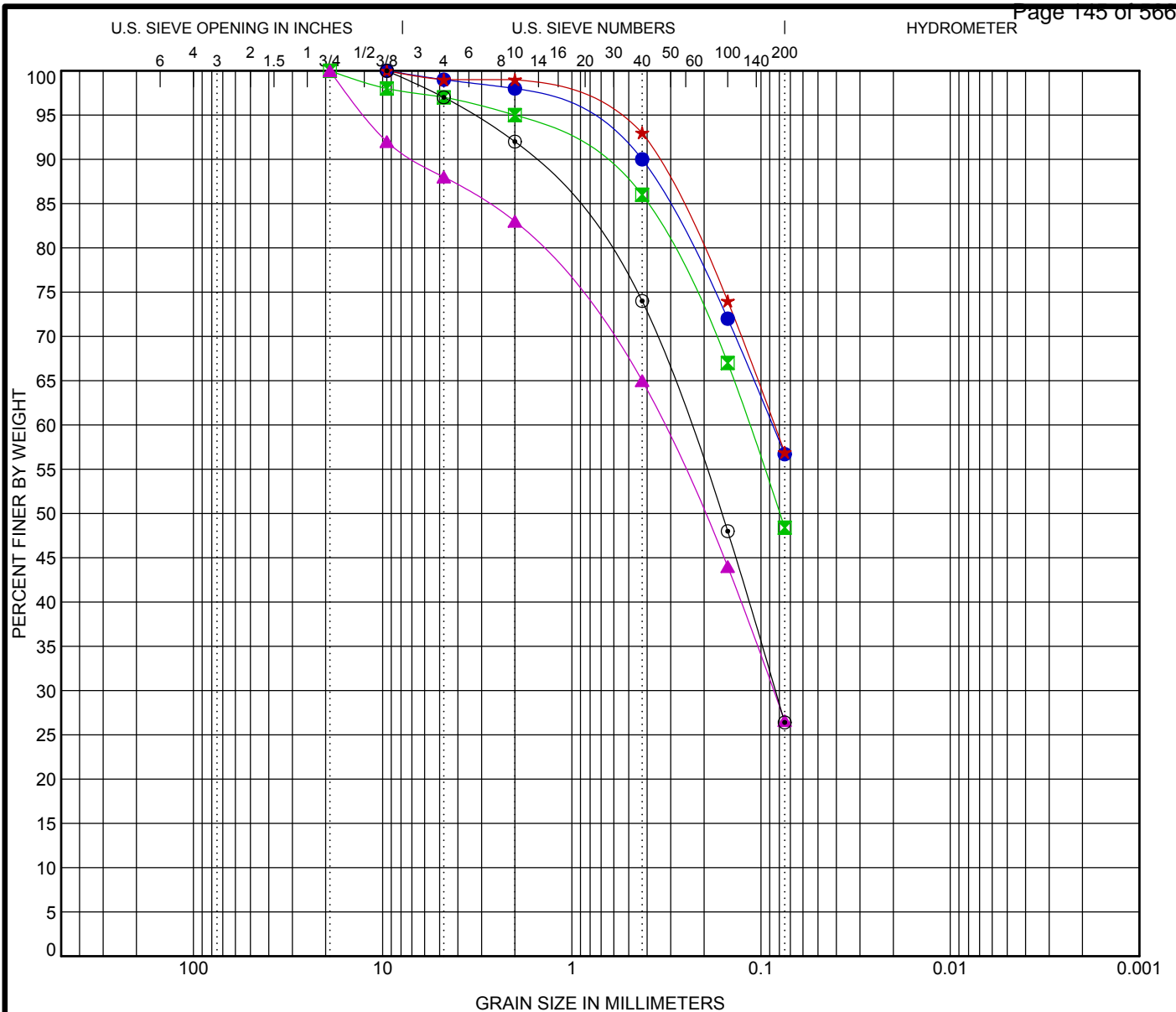


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FIGURE 32



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	8A2S-08	0.8	SANDY LEAN CLAY(CL)			27	13	14		
■	8A2S-08	2.5	CLAYEY SAND(SC)			30	14	16		
▲	8A2S-08	5.0	CLAYEY SAND(SC)			25	13	12		
★	8A2S-09	2.5	SANDY LEAN CLAY(CL)			33	14	19		
⊙	8A2S-10	2.5	CLAYEY SAND(SC)			26	15	11		
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	8A2S-08	0.8	9.5	0.087			1.0	42.3	56.7	
■	8A2S-08	2.5	19	0.116			3.0	48.6	48.4	
▲	8A2S-08	5.0	19	0.332	0.086		12.0	61.4	26.6	
★	8A2S-09	2.5	9.5	0.085			1.0	42.1	56.9	
⊙	8A2S-10	2.5	9.5	0.243	0.084		3.0	70.6	26.4	

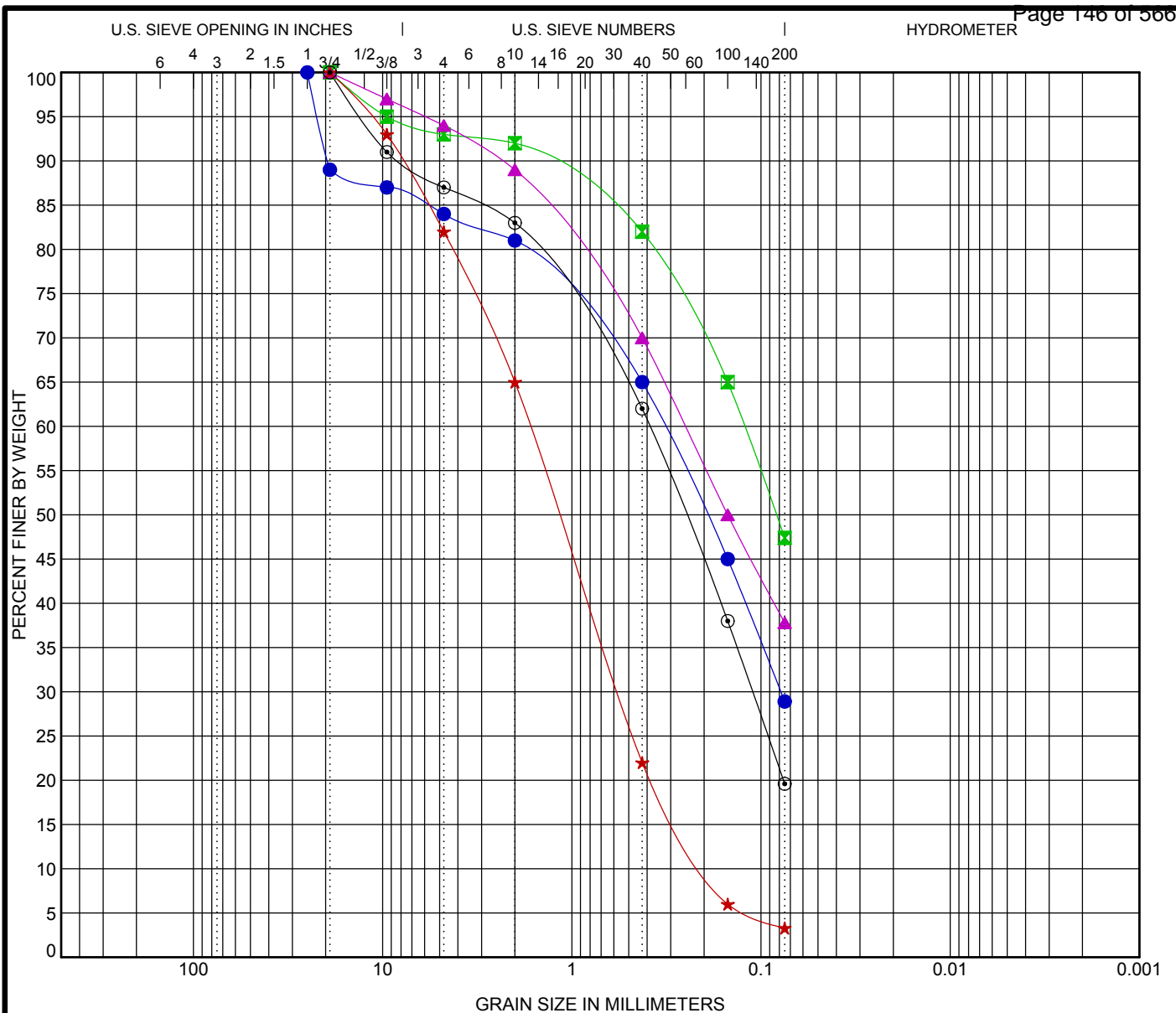


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FIGURE 33



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	8A2S-10	10.0	CLAYEY SAND with GRAVEL(SC)			28	13	15		
■	8A2S-11	2.5	CLAYEY SAND(SC)			34	14	20		
▲	8A2S-11	5.0	CLAYEY SAND(SC)			26	13	13		
★	8A2S-11	15.0	POORLY GRADED SAND with GRAVEL(SP)					NP	0.99	8.58
⊙	10A2S-02	1.0	SILTY SAND (SM)					NP		
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	8A2S-10	10.0	25	0.328	0.079		16.0	55.1	28.9	
■	8A2S-11	2.5	19	0.123			7.0	45.6	47.4	
▲	8A2S-11	5.0	19	0.252			6.0	56.2	37.8	
★	8A2S-11	15.0	19	1.67	0.567	0.195	18.0	78.7	3.3	
⊙	10A2S-02	1.0	19	0.39	0.111		13.0	67.4	19.6	



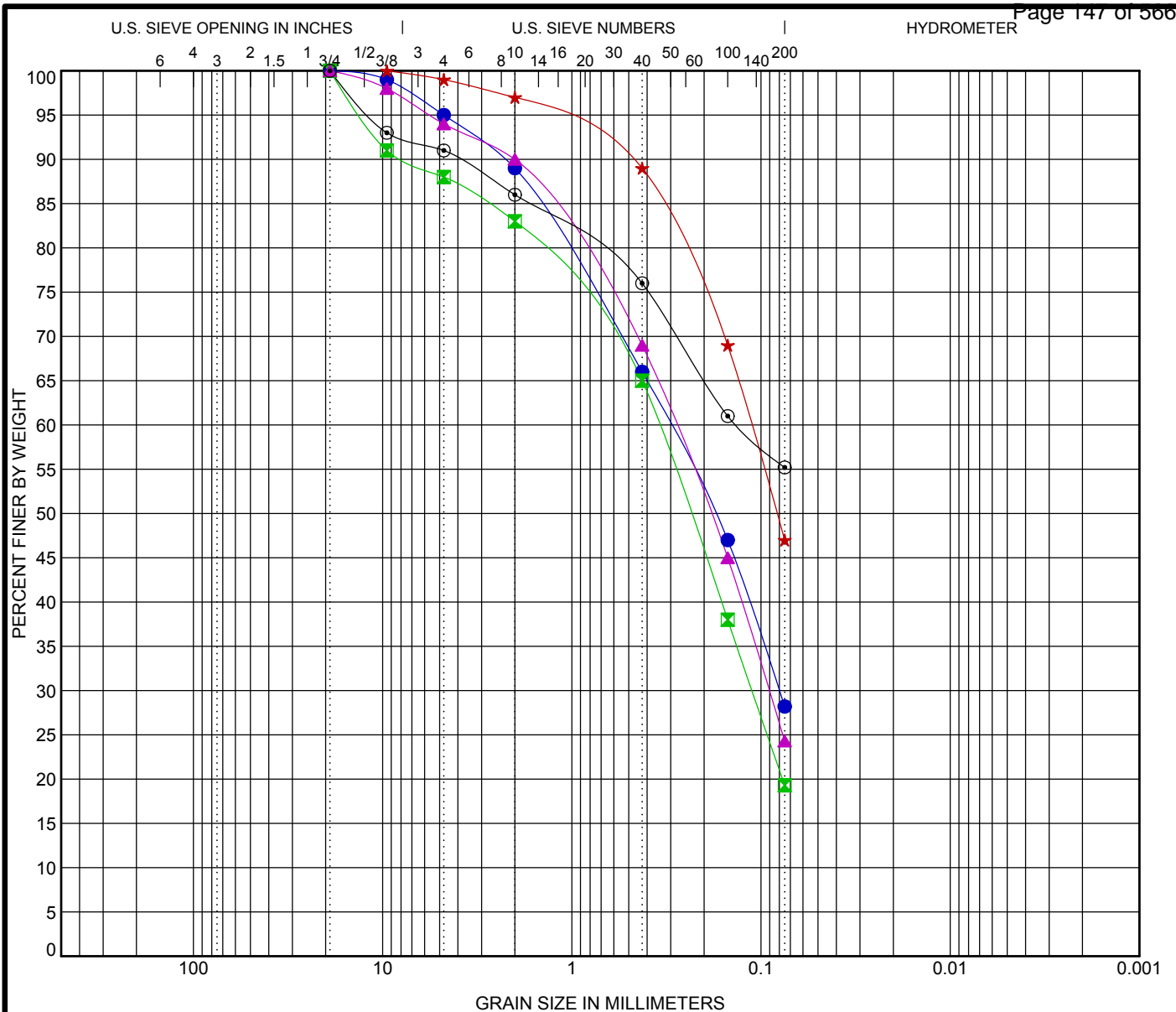
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FIGURE 34



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	10A2S-02	2.5	CLAYEY SAND(SC)			30	13	17		
✕	10A2S-04	8.5	SILTY SAND (SM)							
▲	10A2S-06	8.5	CLAYEY SAND(SC)			21	13	8		
★	10A2S-07	2.5	CLAYEY SAND(SC)			36	13	23		
◎	10A2S-07	8.5	SANDY LEAN CLAY (CL)							
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10A2S-02	2.5	19	0.306	0.08		5.0	66.8	28.2	
✕	10A2S-04	8.5	19	0.35	0.112		12.0	68.7	19.3	
▲	10A2S-06	8.5	19	0.288	0.091		6.0	69.7	24.3	
★	10A2S-07	2.5	9.5	0.113			1.0	52.0	47.0	
◎	10A2S-07	8.5	19	0.133			9.0	35.8	55.2	



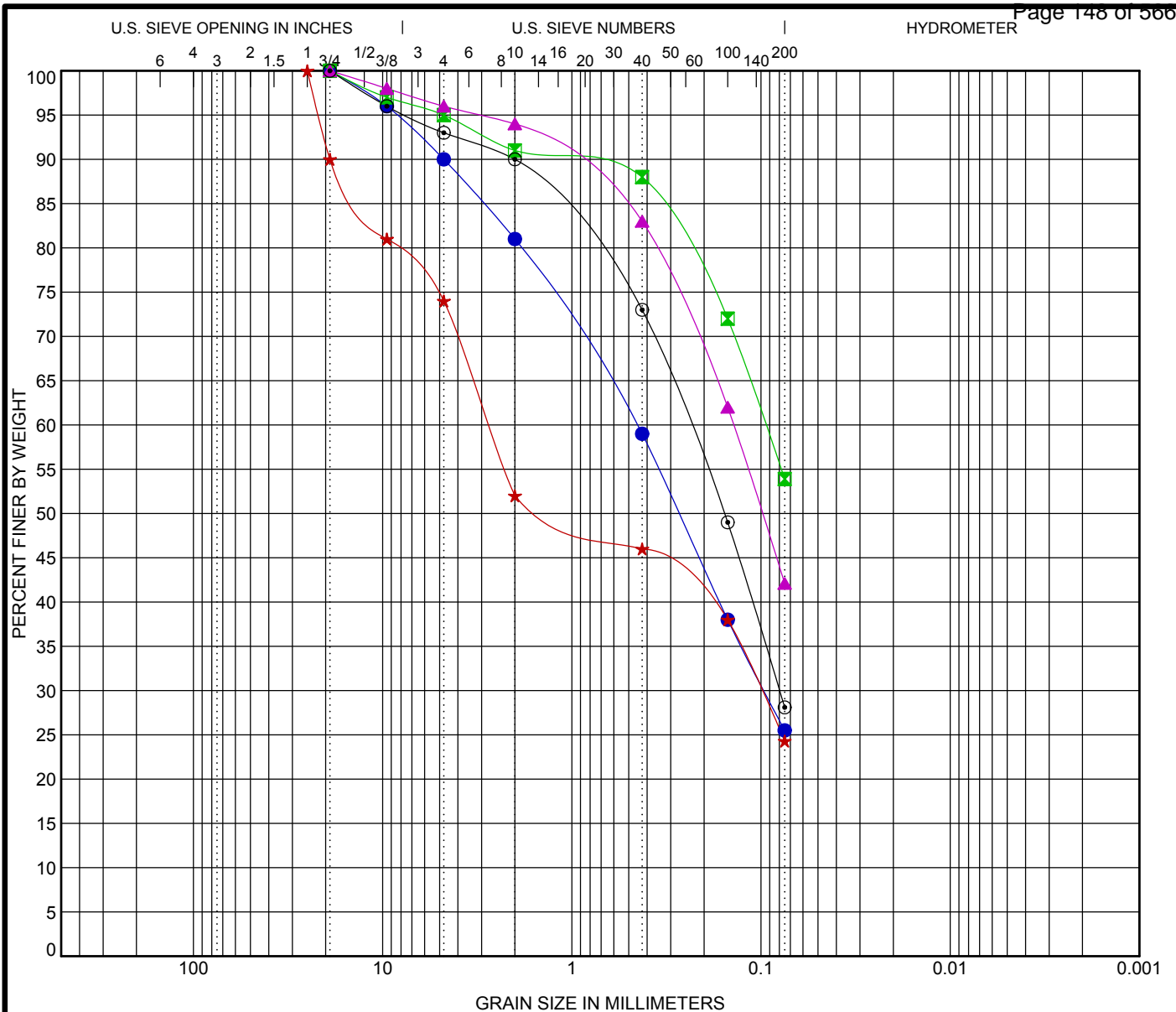
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FIGURE 35



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	10A2S-08	5.0	CLAYEY SAND(SC)			42	21	21		
■	10A2S-08	8.5	SANDY LEAN CLAY(CL)			37	14	23		
▲	10A2S-10	8.5	CLAYEY SAND(SC)			33	13	20		
★	10A2S-11	2.5	CLAYEY SAND with GRAVEL(SC)			38	14	24		
⊙	10A2S-11	8.5	CLAYEY SAND(SC)			31	11	20		
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10A2S-08	5.0	19	0.456	0.096		10.0	64.5	25.5	
■	10A2S-08	8.5	19	0.095			5.0	41.1	53.9	
▲	10A2S-10	8.5	19	0.14			4.0	53.9	42.1	
★	10A2S-11	2.5	25	2.739	0.1		26.0	49.7	24.3	
⊙	10A2S-11	8.5	19	0.242	0.08		7.0	64.9	28.1	



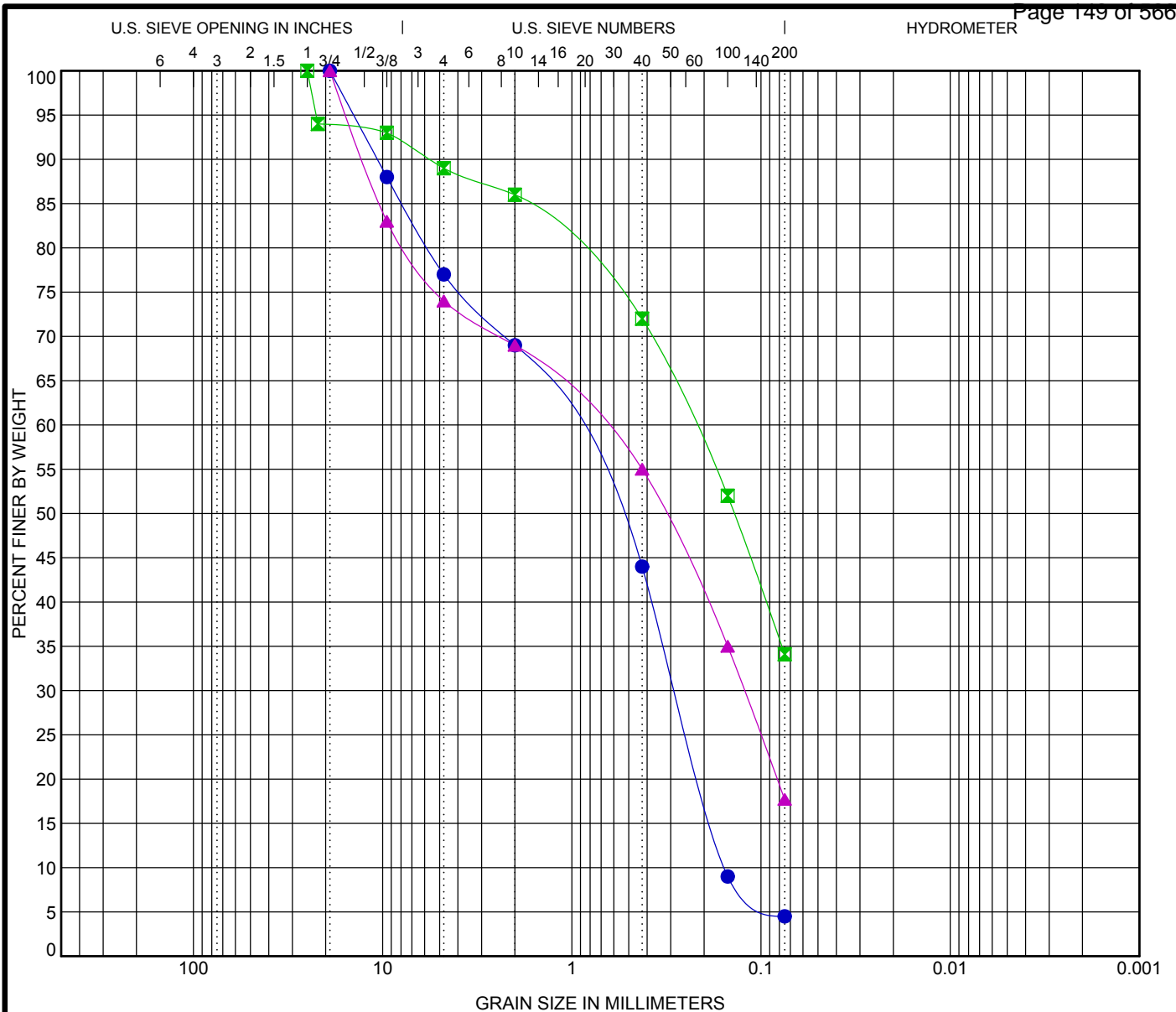
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FIGURE 36



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	10A2S-12	8.5	POORLY GRADED SAND with GRAVEL(SP)					NP	0.44	7.41
■	10A2S-14	8.5	CLAYEY SAND(SC)			33	14	19		
▲	10A2S-15	8.5	CLAYEY SAND with GRAVEL(SC)			21	12	9		
★										
◎										
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10A2S-12	8.5	19	1.145	0.28	0.155	23.0	72.5	4.5	
■	10A2S-14	8.5	25	0.228			11.0	54.9	34.1	
▲	10A2S-15	8.5	19	0.739	0.123		26.0	56.3	17.7	
★										
◎										



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FIGURE 37

CALIFORNIA BEARING RATIO TEST RESULT

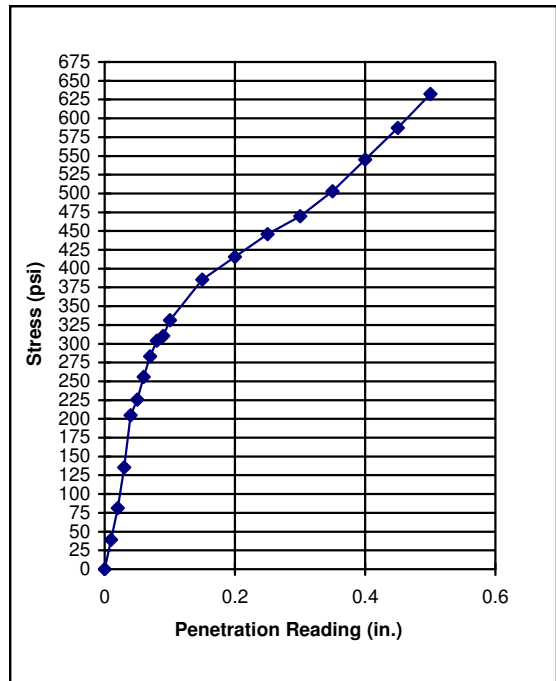
PROJECT : Fort Bliss Sustainment Brigade Facility
Fort Bliss, Texas

PROJECT NO: AEA09-059-00
SAMPLE LOCATION: 10A2S-06
SAMPLE DEPTH: 10" to 3'

SOIL DESCRIPTION: CLAYEY SAND (SC)
Percent Passing No. 200 Sieve = 24%, PI = 21

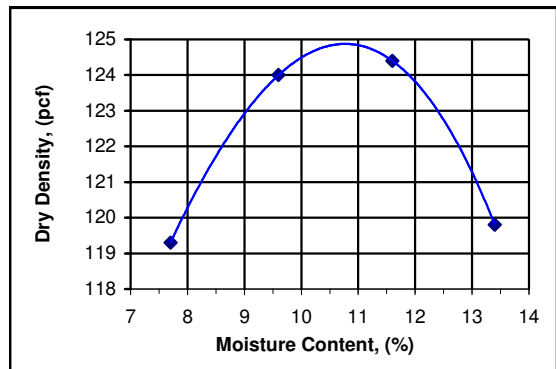
PENETRATION AND NORMAL STRESS DATA

Penetration Reading (in)	Load Reading	Load Lbs	Stress (psi)
0	0	0	0
0.010	13	123	39
0.020	27	256	81
0.030	45	426	136
0.040	68	643	205
0.050	75	710	226
0.060	85	804	256
0.070	94	890	283
0.080	101	956	304
0.090	103	975	310
0.100	110	1041	331
0.150	128	1211	386
0.200	138	1306	416
0.250	148	1401	446
0.300	156	1476	470
0.350	167	1580	503
0.400	181	1713	545
0.450	195	1845	587
0.500	210	1987	633



MOISTURE-DENSITY RELATION OF SOIL

Trial No.	Moisture %	Dry Density pcf
1	7.7	119.3
2	9.6	124
3	11.6	124.4
4	13.4	119.8
Maximum Density (pcf)		124.8
Optim. Moist. Content (%)		10.6



Compaction Effort (Blows/layer)	Dry Density Prior to Soaking (pcf)	Moisture Content Prior to Soaking (%)	Dry Density After Soaking (pcf)	Moisture Content After Soaking (%)	Swell (%)	CBR at 0.1" Pen.	CBR at 0.2" Pen.
38	124.8	10.6	118.7	11.4	5.1	34	28

LABORATORY TEST PROCEDURES : ASTM D-1557, D-1883

CALIFORNIA BEARING RATIO TEST RESULT

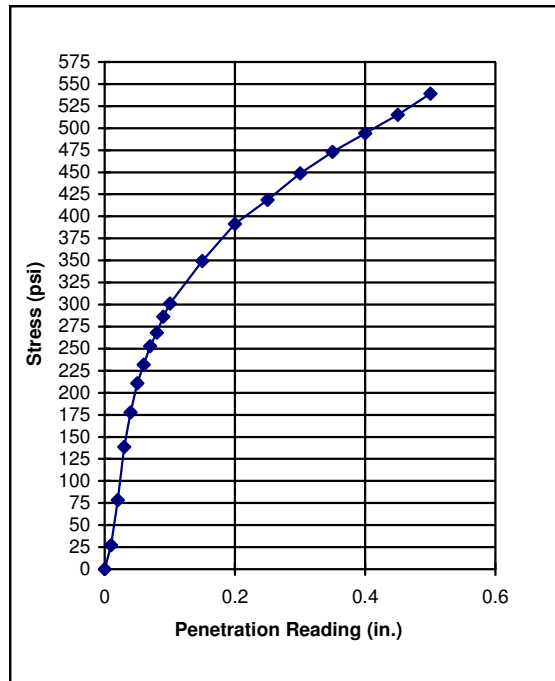
PROJECT : Fort Bliss Sustainment Brigade Facility
Fort Bliss, Texas

PROJECT NO: AEA09-059-00
SAMPLE LOCATION: 10A2S-08
SAMPLE DEPTH: 10" to 3'

SOIL DESCRIPTION: CLAYEY SAND (SC)
Percent Passing No. 200 Sieve = 38%, PI = 19

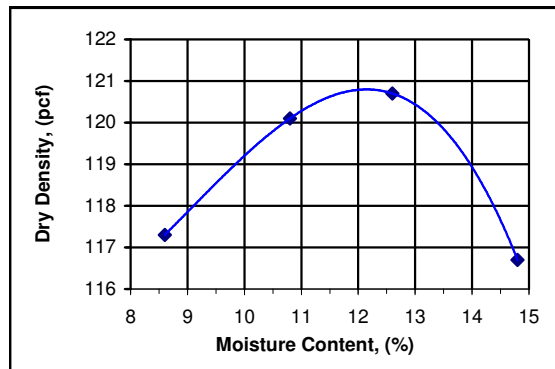
PENETRATION AND NORMAL STRESS DATA

Penetration Reading (in)	Load Reading	Load Lbs	Stress (psi)
0	0	0	0
0.010	9	85	27
0.020	26	246	78
0.030	46	435	139
0.040	59	558	178
0.050	70	662	211
0.060	77	729	232
0.070	84	795	253
0.080	89	842	268
0.090	95	899	286
0.100	100	946	301
0.150	116	1098	349
0.200	130	1230	392
0.250	139	1315	419
0.300	149	1410	449
0.350	157	1486	473
0.400	164	1552	494
0.450	171	1618	515
0.500	179	1694	539



MOISTURE-DENSITY RELATION OF SOIL

Trial No.	Moisture %	Dry Density pcf
1	8.6	117.3
2	10.8	120.1
3	12.6	120.7
4	14.8	116.7
Maximum Density (pcf)		120.9
Optim. Moist.Content (%)		12.0



Compaction Effort (Blows/layer)	Dry Density Prior to Soaking (pcf)	Moisture Content Prior to Soaking (%)	Dry Density After Soaking (pcf)	Moisture Content After Soaking (%)	Swell (%)	CBR at 0.1" Pen.	CBR at 0.2" Pen.
38	120.9	12.0	113.8	13.3	6.2	31	27

LABORATORY TEST PROCEDURES : ASTM D-1557, D-1883

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/29/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	10.1	lbs
Test Location:	10A2S-01			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	60	0	-	-	-	-
5	120	60	12	2	24	8
5	160	40	8	2	16	13
5	195	35	7	2	14	15
5	225	30	6	2	12	18
5	260	35	7	2	14	15
5	300	40	8	2	16	13
5	355	55	11	2	22	9
5	410	55	11	2	22	9
5	465	55	11	2	22	9
5	530	65	13	2	26	8
5	610	80	16	2	32	6
5	670	60	12	2	24	8
5	730	60	12	2	24	8
5	770	40	8	2	16	13
5	830	60	12	2	24	8
5	880	50	10	2	20	10
5	940	60	12	2	24	8
1	950	10	10	2	20	10
		-	-	-	-	-
		-	-	-	-	-

(1) Number of hammer blows between test readings

(2) Cumulative penetration after each set of hammer blows

(3) Difference in cumulative penetration (2) between readings

(4) (3) Divided by (1)

(5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer

(6) (4) X (5)

(7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/29/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	10.1	lbs
Test Location:	10A2S-04			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	

(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	65	0	-	-	-	-
5	100	35	7	2	14	15
5	135	35	7	2	14	15
5	160	25	5	2	10	20
5	180	20	4	2	8	30
5	200	20	4	2	8	30
5	220	20	4	2	8	30
5	240	20	4	2	8	30
10	280	40	4	2	8	30
10	330	50	5	2	10	20
10	400	70	7	2	14	15
10	470	70	7	2	14	15
10	545	75	8	2	15	14
10	615	70	7	2	14	15
10	705	90	9	2	18	11
10	805	100	10	2	20	10
5	860	55	11	2	22	9
5	915	55	11	2	22	9
4	950	35	9	2	17	12
		-	-	-	-	-
		-	-	-	-	-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows
 (3) Difference in cumulative penetration (2) between readings
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/29/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	10.1	lbs
Test Location:	10A2S-06			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	60	0	-	-	-	-
2	120	60	30	2	60	3
5	165	45	9	2	18	11
5	220	55	11	2	22	9
5	280	60	12	2	24	8
5	350	70	14	2	28	7
5	445	95	19	2	38	5
5	520	75	15	2	30	6
5	600	80	16	2	32	6
5	685	85	17	2	34	6
5	750	65	13	2	26	8
5	820	70	14	2	28	7
5	890	70	14	2	28	7
5	940	50	10	2	20	10
5	950	10	2	2	4	60
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-

(1) Number of hammer blows between test readings

(2) Cumulative penetration after each set of hammer blows

(3) Difference in cumulative penetration (2) between readings

(4) (3) Divided by (1)

(5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer

(6) (4) X (5)

(7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/29/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	10.1, then 17.6	lbs
Test Location:	10A2S-08			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	50	0	-	-	-	-
2	115	65	33	2	65	3
5	150	35	7	2	14	15
5	180	30	6	2	12	18
5	270	90	18	2	36	5
5	345	75	15	2	30	6
5	410	65	13	2	26	8
5	465	55	11	2	22	9
5	520	55	11	2	22	9
10	600	80	8	2	16	13
10	650	50	5	2	10	20
10	680	30	3	2	6	40
10	710	30	3	2	6	40
5	740	30	6	1	6	40
10	800	60	6	1	6	40
10	840	40	4	1	4	60
10	870	30	3	1	3	80
10	890	20	2	1	2	100
10	920	30	3	1	3	80
10	950	30	3	1	3	80
		-	-	-	-	-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows
 (3) Difference in cumulative penetration (2) between readings
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

FIGURE 43
 Friday, February 19, 2010

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/30/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	10.1, then 17.6	lbs
Test Location:	10A2S-11			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	

(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	65	0	-	-	-	-
5	130	65	13	2	26	8
5	170	40	8	2	16	13
5	210	40	8	2	16	13
5	240	30	6	2	12	18
6	330	90	15	2	30	6
5	460	130	26	2	52	4
10	500	40	4	2	8	30
10	520	20	2	2	4	60
10	575	55	6	2	11	20
10	675	100	10	1	10	20
10	780	105	11	1	10	20
10	870	90	9	1	9	25
5	910	40	8	1	8	30
5	950	40	8	1	8	30
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows
 (3) Difference in cumulative penetration (2) between readings
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

FIGURE 44
 Friday, February 19, 2010

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/30/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	17.6	lbs
Test Location:	10A2S-13			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	60	0	-	-	-	-
5	110	50	10	1	10	20
3	210	100	33	1	33	6
3	270	60	20	1	20	10
3	300	30	10	1	10	20
4	330	30	8	1	7	35
4	410	80	20	1	20	10
4	600	190	48	1	47	4
5	710	110	22	1	22	9
5	855	145	29	1	29	7
2	900	45	23	1	22	9
2	930	30	15	1	15	14
2	950	20	10	1	10	20
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows
 (3) Difference in cumulative penetration (2) between readings
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	W9126G-09-D-0001 (PN55361)			Date Tested:	9/30/2009	
Name:	Fort Bliss Sustainment Brigade Facility			Hammer Weight:	17.6	lbs
Test Location:	10A2S-15			Water Table Depth:	Dry	ft
Drilling Agency:	Raba-Kistner Consultants (SW), Inc.			Soil Type:	See Boring Log	

(1) Number of Blows	(2) Cumulative Penetration (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
-	60	0	-	-	-	-
5	100	40	8	1	8	30
5	150	50	10	1	10	20
5	270	120	24	1	24	8
2	310	40	20	1	20	10
2	340	30	15	1	15	14
2	360	20	10	1	10	20
5	380	20	4	1	4	60
10	430	50	5	1	5	50
5	510	80	16	1	16	13
5	590	80	16	1	16	13
5	660	70	14	1	14	15
5	700	40	8	1	8	30
5	740	40	8	1	8	30
5	780	40	8	1	8	30
5	810	30	6	1	6	40
10	880	70	7	1	7	35
10	940	60	6	1	6	40
4	950	10	3	1	2	100
		-	-	-	-	-
		-	-	-	-	-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows
 (3) Difference in cumulative penetration (2) between readings
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

SPECIALIZED SOIL TESTING REPORT

PROJECT NUMBER: COE PN 55361 (R-K Project No. AEA09-059-00)

PROJECT NAME: Fort Bliss Sustainment Brigade Facility

IN-SITU ELECTRICAL SOIL RESISTIVITY

Using a Nilsson Model 400 Soil Resistance Meter in a Wenner (4-pin) Linear Configuration

Location	Direction ¹	Spacing ² , a (ft)	Resistance, R (ohms)	Resistivity ³ , ρ (ohm-cm)	Date Measured
8A2S-06	East-West	1	6.6	1,264	10/6/09
		2 1/2	5.4	2,585	10/6/09
		5	2.6	2,490	10/6/09

(1) Direction or orientation of test, i.e., N-S, E-W, NE-SW, NW-SE, or lengthwise, widthwise (if the planned building footprint is regularly shaped)

(2) Spacing between electrode-pins

(3) Resistivity, $\rho=191.5aR$ per ASTM G57

LABORATORY SOIL CORROSIVITY

Location	Depth (ft)	pH	Chlorides (mg/L)	Sulfates (mg/L)	Date Tested
8A2S-07	2 1/2	7.8	-	-	10/2/09
8A2S-07	5	8.3 to 8.4	15 to 50	56.5	10/2/09, 10/9/09
8A2S-07	7 1/2	8.4	25	-	10/2/09
8A2S-07	10	8.4	25	-	10/2/09

LABORATORY THERMAL SOIL RESISTIVITY

Using a Decagon KD2 Pro Resistivity Meter

Location	Depth (ft)	Soil Density Tested, γ_t (pcf)	Soil Moisture Content, w (%)	Average Thermal Resistivity ⁴ , ρ_T (m·K/W)
8A2S-06	2	122.0	9.0	0.51

(4) Using a 10-cm needle per IEEE Standard 442

*AM2

FORT BLISS, TEXAS
JLENS BATTERY

GEOTECHNICAL DATA

DECEMBER 2009

Friday, February 19, 2010

Requirements for the Design-Build Contractor's Foundation and Pavement Design Analysis. The successful proposer shall provide a Foundation and Pavement Design Analysis after contract award. The Foundation and Pavement Design Analysis (Report) shall include a description of the project, including a discussion of any unusual features of the project, a discussion for each structure that requires a foundation system, and a discussion of each pavement type. The foundation, pavement, and material analyses shall be performed by and sealed by a licensed professional engineer.

(1) Recommended Foundation System(s). If more than one foundation system is recommended, separate subparagraphs shall be used to discuss each foundation system. The subparagraphs shall provide a detailed description of the foundation system as well as specific design and construction requirements. The location and type of structure supported by that foundation system should also be discussed. Foundation design parameters and considerations should be provided and shall include as a minimum the following items: allowable bearing pressure(s); bearing elevations for each recommended foundation system; a minimum depth the foundation system shall bear below outside finished grade; foundation spacing requirements; foundation structural design methodology to be used; shrink-swell potential of the active subgrade; the design loads used to size the foundation elements; special considerations for deformation sensitive areas such as restrooms or other areas (i.e., tiled areas); a modulus of subgrade reaction; soil unit weights; at-rest and active earth pressure coefficients; anticipated settlement/differential settlement; and applicability (of each of the aforementioned items) to the design.

It is anticipated that a shallow foundation system consisting of reinforced concrete continuous spread and/or spot spread footings will be suitable for the proposed facilities. Footings should bear at a uniform depth, but at least 2.0 feet below outside finish grade. Footings should be sized for an allowable bearing capacity of 2.0 ksf (net). Due to the potential presence of loose sand in the upper 2.5 feet, it is recommended that footings should bear at least 2.5 feet below existing grade, if permitted by site grading requirements. If, due to site grading requirements, footings must be placed at depths shallower than 2.5 feet below existing grade, or if footings must be placed in fill above existing grade, the existing soils below the footings should be removed (excavated) to a depth of 2.5 feet below existing grade. Nonexpansive fill shall then be placed in controlled lifts not exceeding 8 inches in loose thickness and compacted to at least 95 percent of maximum laboratory density as determined in accordance with ASTM D 1557 between the excavation surface and the base of the footings. The earthwork (fill type and compaction) requirements also apply to footings that must be founded in fill above existing grade. Footings founded within fill above existing grade or at depths shallower than 2.5 feet below existing grade, in compliance with the earthwork requirements specified herein, should be sized for an allowable bearing pressure of 2.0 ksf (net). The load used to size the footings should consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent.

Floor slabs placed on-grade should be isolated from any portion of the building structure using 1/2-inch expansion joints. In doing so, the building structure-floor slab interface should be designed to accept vertical movements so that the operation of the facility will not be affected. This will result in the best performance. Transitional areas, such as door openings, can be doweled to prevent offsets from occurring. In these areas, the slab should bear on the grade beam to create a single joint at one face of the grade beam. Slab edges should extend to the outside face of the grade beam at the exterior door locations. A polyethylene vapor barrier (10-mil minimum) should be placed beneath floor slabs supported on-grade; however, a capillary water barrier is not required.

Nonexpansive soils are satisfactory materials having a plasticity index not less than 4 nor greater than 12 when tested in accordance with ASTM D 4518. On-site soils can be used as nonexpansive fill if they meet the aforementioned material definition. Satisfactory materials include materials classified in ASTM D 2487 as GW, GM, GC, GP, SW, SP, SM, SC, CL, and CH and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

(2) Subgrade Preparation. This section shall include a discussion on all requirements for excavation of existing subgrade materials, removal of existing unsuitable materials, replacement of excavated materials with nonexpansive and satisfactory materials, and minimum thickness of nonexpansive fill beneath

building foundations. Provide compaction requirements in accordance with ASTM D 1557 for the raw subgrade, fill, and backfill materials. Foundation and pavement material definitions shall be presented.

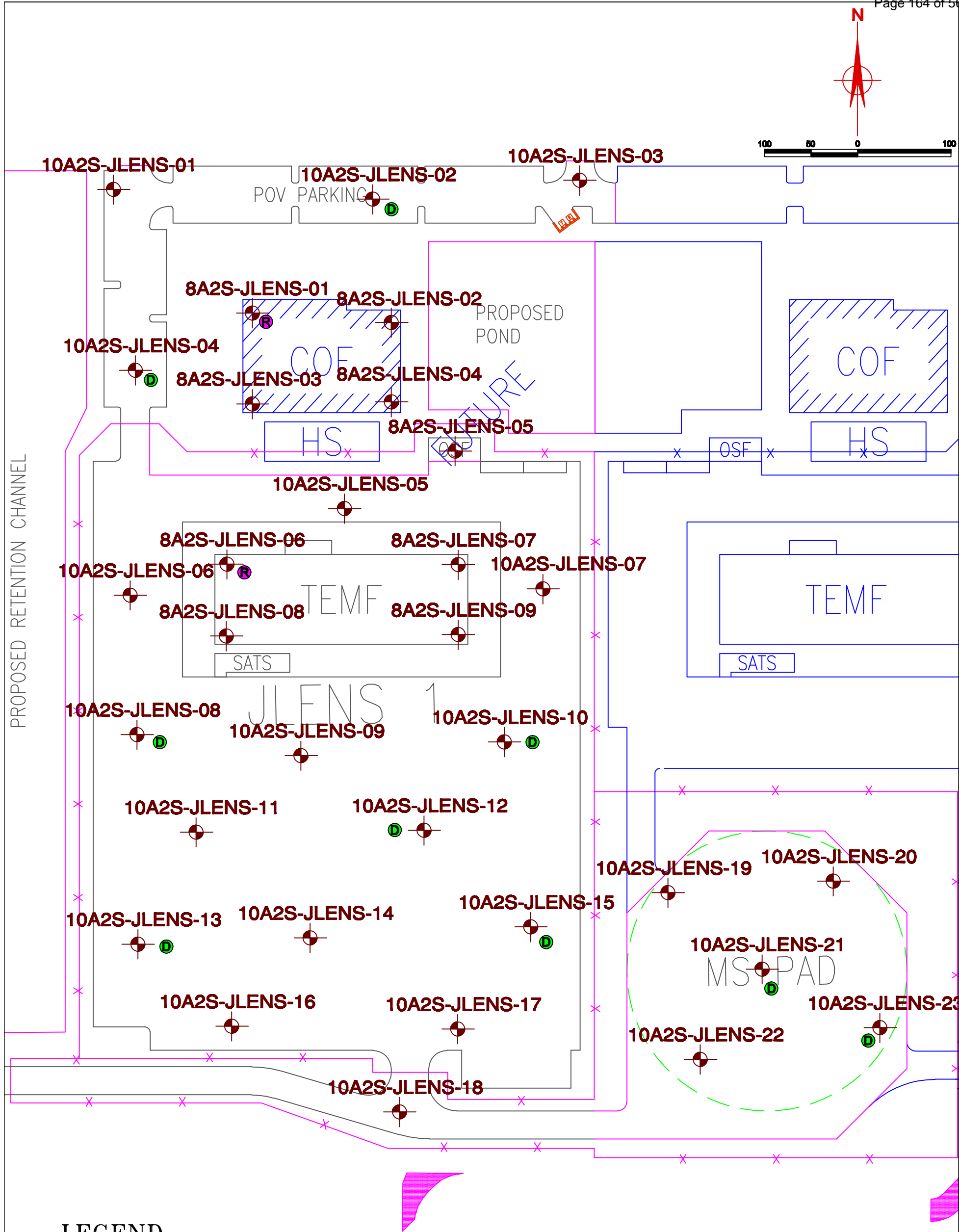
(3) Recommended Pavement Sections. Provide separate subparagraphs for each rigid, flexible (if required), and aggregate-surfaced pavement structure included in the project. Each pavement design shall include as a minimum the following items: traffic types, road classifications and design indexes; subgrade strength values (CBR and modulus of subgrade reaction values for the specified compactive effort); pavement material thicknesses and compaction requirements; and concrete flexural strength for designated time frame. Compaction requirements for pavement material layers shall be in accordance with ASTM D 1557.

(4) Exhibits to be Included in the Design-Build Contractor's Foundation and Pavement Design Analysis. The following exhibits shall be included in the Design-Build contractor's Foundation and Pavement Design Analysis. The Design-Build contractor may use the information provided in this report to satisfy these requirements, or may supplement the information provided herein with additional subsurface drilling and testing, at his option. Required exhibits to be included with the Design-Build contractor's Foundation and Pavement Design Analysis include:

- Site Plan with Boring Locations and Legend;
- Boring Logs;
- Plasticity Chart;
- Standard Penetration Tests versus Depth of Boring (if applicable);
- Moisture Content versus Depth (Chart);
- Moisture Content-Liquid Limit-Plastic Limit versus Depth (Chart);
- Strength Tests Results versus Depth (Chart);
- Tabulation of Laboratory Test Results (to include Boring Number, Sample Number, Depth, Laboratory Classification, Visual Descriptions, Grain Size Analysis (%Gravel, %Sand, %Fines), LL, PL, PI, MC, Unit Weight, and Strength Test Data;
- Consolidation-Expansion Tests/Swell Pressure Tests (if applicable).

APPENDIX A

BORING LOCATIONS & LOGS OF BORINGS



DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80012; W 106.417				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 5-Nov-09		COMPLETED 5-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1		ASPHALT (approximately 1.5 inches)	11		0.0 1.5	SPT= 2-6-5	
	0.7		BASE Course (approximately 7 inches)	5		2.5 4.0	SPT= 2-2-3	
	3.0		FILL: SILTY SAND (SM) reddish-brown, moist, with trace asphaltic concrete debris	8		5.0 6.5	SPT= 3-3-5	
			- with calcareous material from 3 to 5 feet	11		7.5 9.0	SPT= 4-5-6	
	10.5		CLAYEY SAND (SC) loose to medium dense, light brown, moist	13		10.0 11.5	SPT= 3-6-8	
			- with calcareous material from 3 to 5 feet	26		12.5 14.0	SPT= 6-11-15	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist to dry	39		15.0 16.5	SPT= 9-15-24	
			- with trace gravel at 10 feet	49		17.5 19.0	SPT= 9-20-29	
				66		20.0 21.5	SPT= 11-24-42	
	25.0			82		23.5 25.0	SPT= 18-33-49	
Boring Terminated								
NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees. 4. Surface resistivity measurements per ASTM G57: $r=191.5aR$, where r is soil resistivity (ohms-cm), a is spacing (feet) and R is measured resistance (ohms):								
			a r					
			1 26,810					
			2.5 15,320					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80005; W 106.41644				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 13-Nov-09		COMPLETED 13-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST		Carlos Serrano, E.I.T		
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	11		0.0 1.5	SPT= 3-6-5	
	0.6							
	2.5		BASE Course (approximately 7 inches)	5		2.5 4.0	SPT= 2-2-3	
			SILTY SAND (SM) medium dense, reddish-brown, moist	21		5.0 6.5	SPT= 4-9-12	
	7.5		CLAYEY SAND (SC) loose, brown, with calcareous material from 2.5 to 5.5 feet - calcareous, medium dense, below 5.5 feet	9		7.5 9.0	SPT= 4-4-5	
	10.0			16		10.0 11.5	SPT= 4-7-9	
			SILTY SAND (SM) loose to medium dense, brown, moist	28		12.5 14.0	SPT= 6-12-16	
			POORLY GRADED SAND (SP) light brown, slightly moist	30		15.0 16.5	SPT= 7-13-17	
				52		17.5 19.0	SPT= 12-24-28	
				48		20.0 21.5	SPT= 10-21-27	
				84		23.5 25.0	SPT= 15-34-50	
	25.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79986; W 106.41697				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 6-Nov-09		COMPLETED 6-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	8		0.0 1.5	SPT= 2-3-5	
	0.8		BASE Course (approximately 10 inches)	4		2.5 4.0	SPT= 2-2-2	
	4.0		FILL: SILTY SAND (SM) reddish-brown, very moist with trace asphaltic concrete debris	5		5.0 6.5	SPT= 3-3-2	
	7.0		SILTY SAND (SM) loose, reddish-brown, moist	13		7.5 9.0	SPT= 2-6-7	
	12.0		CLAYEY SAND (SC) calcareous, medium dense, tan, moist - with a 3-inch clay lense at 11 feet	23		10.0 11.5	SPT= 4-7-16	
	15.5		SILTY SAND (SM) loose, reddish-brown, moist	22		12.5 14.0	SPT= 5-9-13	
			POORLY GRADED SAND (SP) very dense, grayish-brown, slightly moist - with trace gravel from 15.5 to 21.5 feet	58		15.0 16.5	SPT= 7-25-33	
				60		17.5 19.0	SPT= 14-28-32	
				80		20.0 21.5	SPT= 12-35-45	
	25.0			76		23.5 25.0	SPT= 14-29-47	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79983; W 106.41652				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1		ASPHALT (approximately 1.5 inches)	9		0.0 1.5	SPT= 2-5-4	
	0.8		BASE Course (approximately 10 inches)	5		2.5 4.0	SPT= 2-2-3	
	3.0		SILTY SAND (SM) loose, reddish-brown, moist	6		5.0 6.5	SPT= 3-2-4	
			CLAYEY SAND (SC) loose, light brown, moist, with calcareous material - calcareous, tan below 8 feet	9		7.5 9.0	SPT= 4-4-5	
	11.0			9		10.0 11.5	SPT= 3-4-5	
			SILTY SAND (SM) medium dense, brown, moist	17		12.5 14.0	SPT= 6-7-10	
	13.5		CLAYEY SAND (SC) dense, light brown, moist, with trace calcareous material	32		15.0 16.5	SPT= 7-12-20	
	15.0		POORLY GRADED SAND (SP) light brown, slightly moist	34		17.5 19.0	SPT= 8-15-19	
				48		20.0 21.5	SPT= 10-20-28	
				84		23.5 25.0	SPT= 16-34-50	
	25.0		- very dense, with trace gravel below 23.5 feet					
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79963; W 106.41589				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 13-Nov-96 COMPLETED 13-Nov-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	11		0.0 1.5	SPT= 3-6-5	
	0.8		BASE Course (approximately 10 inches)	11		2.5 4.0	SPT= 3-6-5	
	3.5		SILTY SAND (SM) medium dense, reddish-brown, moist	17		5.0 6.5	SPT= 5-7-10	
	7.0		CLAYEY SAND (SC) medium dense, tan, moist, calcareous	14		7.5 9.0	SPT= 3-5-9	
	10.0		SILTY SAND (SM) medium dense, brown, moist, with calcareous material	22		10.0 11.5	SPT= 7-9-13	
			POORLY GRADED SAND (SP) medium dense to dense, light brown, slightly moist	39		12.5 14.0	SPT= 9-16-23	
			- with trace gravel at 10 feet - with trace gravel at 15 feet - with a 1-inch clay lense from 15.5 to 16 feet	37		15.0 16.5	SPT= 8-13-24	
	20.0			44		18.5 20.0	SPT= 11-20-24	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS																					
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)																								
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79932; W 106.41719				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL																								
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75																								
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0																				
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A																								
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 10-Nov-09 COMPLETED 10-Nov-09																						
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A																								
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %																								
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T																								
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i																				
	2.5		SILTY SAND (SM) medium dense, reddish-brown, moist	12		0.0 1.5	SPT= 4-7-5																					
			- topped with gravel at surface	13		2.5 4.0	SPT= 2-6-7																					
	8.0		CLAYEY SAND (SC) medium dense, tan to light brown, moist	15		5.0 6.5	SPT= 4-5-10																					
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist	11		7.5 9.0	SPT= 3-5-6																					
				14		10.0 11.5	SPT= 2-6-8																					
				30		12.5 14.0	SPT= 7-13-17																					
				39		15.0 16.5	SPT= 9-18-21																					
				55		17.5 19.0	SPT= 10-22-32																					
				55		20.0 21.5	SPT= 14-24-31																					
	25.0			79		23.5 25.0	SPT= 15-30-49																					
Boring Terminated																												
NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees. 4. Surface resistivity measurements per ASTM G57: $r=191.5aR$, where r is soil resistivity (ohms-cm), a is spacing (feet) and R is measured resistance (ohms):																												
<table> <tr> <td>a</td> <td>r</td> </tr> <tr> <td>1</td> <td>10,724</td> </tr> <tr> <td>2</td> <td>14,171</td> </tr> <tr> <td>2.5</td> <td>13,405</td> </tr> <tr> <td>3</td> <td>13,788</td> </tr> <tr> <td>4</td> <td>12,256</td> </tr> <tr> <td>5</td> <td>12,448</td> </tr> <tr> <td>10</td> <td>15,320</td> </tr> <tr> <td>15</td> <td>20,108</td> </tr> <tr> <td>20</td> <td>21,831</td> </tr> </table>				a	r	1	10,724	2	14,171	2.5	13,405	3	13,788	4	12,256	5	12,448	10	15,320	15	20,108	20	21,831					
a	r																											
1	10,724																											
2	14,171																											
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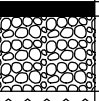

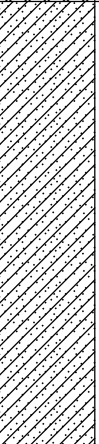
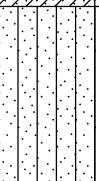
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.7993; W 106.41637				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) loose, reddish-brown, moist	9		0.0 1.5	SPT= 4-4-5	
			- topped with gravel at surface	14		2.5 4.0	SPT= 4-8-6	
	7.0		CLAYEY SAND (SC) medium dense, light brown, moist, with calcareous material	11		5.0 6.5	SPT= 5-5-6	
			POORLY GRADED SAND (SP) loose to medium dense, grayish-brown, slightly moist	10		7.5 9.0	SPT= 3-5-5	
			- very dense at 12.5 feet	18		10.0 11.5	SPT= 4-7-11	
	15.5		- dense below 15 feet	59		12.5 14.0	SPT= 10-23-36	
	17.0		CLAY hard, dark brown, moist, with trace calcareous material	35		15.0 16.5	SPT= 8-13-22	
			POORLY GRADED SAND (SP) very dense, grayish-brown, slightly moist, with trace gravel	56		17.5 19.0	SPT= 11-26-30	
				68		20.0 21.5	SPT= 11-31-37	
	25.0			73		23.5 25.0	SPT= 16-33-40	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								

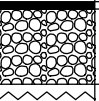


DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79914; W 106.41716				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) loose, reddish-brown, moist	9		0.0 1.5	SPT= 5-6-3	
			- topped with gravel at surface	23		2.5 4.0	SPT= 27-13-10	
	7.0		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	19		5.0 6.5	SPT= 6-9-10	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist	27		7.5 9.0	SPT= 9-13-14	
			- with trace gravel from 7 to 16.5 feet	26		10.0 11.5	SPT= 9-12-14	
			- dense below 12.5 feet	32		12.5 14.0	SPT= 9-16-16	
				30		15.0 16.5	SPT= 10-13-17	
				31		17.5 19.0	SPT= 9-13-18	
				32		20.0 21.5	SPT= 9-14-18	
	25.0		- very dense below 23.5 feet	67		23.5 25.0	SPT= 16-27-40	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					



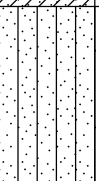
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79912; W 106.4164				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-JLENS-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 11-Nov-09		COMPLETED 11-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST		Carlos Serrano, E.I.T		
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	9		0.0 1.5	SPT= 4-5-4	
	0.5		BASE Course (approximately 6 inches)	10		2.5 4.0	SPT= 3-4-6	
	3.0		SILTY SAND (SM) loose, reddish-brown, slightly moist,	13		5.0 6.5	SPT= 6-7-6	
	7.0		CLAYEY SAND (SC) calcareous, medium dense, tan, moist	11		7.5 9.0	SPT= 3-5-6	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel - dense from 12.5 to 17.5 feet	21		10.0 11.5	SPT= 5-9-12	
				39		12.5 14.0	SPT= 8-17-22	
				47		15.0 16.5	SPT= 11-22-25	
				50		17.5 19.0	SPT= 14-22-28	
			- very dense below 17.5 feet	70		20.0 21.5	SPT= 11-29-41	
				64		23.5 25.0	SPT= 16-30-34	
	25.0		Boring Terminated					
			NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					


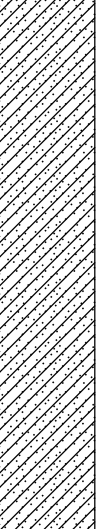
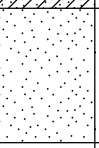
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80058; W 106.41743				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 4-Nov-09		COMPLETED 4-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1 0.5		ASPHALT (approximately 1.5 inches)	7		0.0 1.5	SPT= 2-3-4	
			BASE Course (approximately 6 inches)					
	2.0		FILL: SILTY SAND (SM) loose, reddish-brown, slightly moist, with trace calcareous material					
			CLAYEY SAND (SC) dense, tan, slightly moist, calcareous	36		2.5 4.0	SPT= 13-18-18	
			- loose at 5 feet	9		5.0 6.5	SPT= 4-4-5	
	8.5		POORLY GRADED SAND (SP) dense, grayish-brown, slightly moist, with trace gravel	32		8.5 10.0	SPT= 6-14-18	
	10.0		Boring Terminated					
			NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80054; W 106.4166				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.3		ASPHALT (approximately 3 inches)	7		0.0 1.5	SPT= 5-4-3	
	0.8		BASE Course (approximately 7 inches)					
			FILL: SILTY SAND (SM) loose, reddish-brown, moist					
	3.0			7		2.5 4.0	SPT= 3-3-4	
			CLAYEY SAND (SC) loose, brown, moist, with trace calcareous material					
				5		5.0 6.5	SPT= 3-2-3	
	8.0							
			SILTY SAND (SM) loose, medium dense, light brown, slightly moist	10		8.5 10.0	SPT= 6-5-5	
	10.0							
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District		SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)			
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80056; W 106.41593				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL			
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75			
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4 UNDISTURBED 0	
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A			
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry			
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09			
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A			
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %			
				19. GEOLOGIST Carlos Serrano, E.I.T			
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h
	0.2		ASPHALT (approximately 2 inches)	5		0.0 1.5	SPT= 2-3-2
	1.0		BASE Course (approximately 6 inches)				
	3.0		FILL: SILTY SAND (SM) loose, reddish-brown, moist	6		2.5 4.0	SPT= 2-3-3
	8.0		CLAYEY SAND (SC) loose to medium dense, tan, slightly moist	14		5.0 6.5	SPT= 4-6-8
	10.0		SILTY SAND (SM) loose, brown, moist	6		8.5 10.0	SPT= 3-3-3
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.				

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79987; W 106.41741				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 13-Nov-09		COMPLETED 13-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1		ASPHALT (approximately 1 inches)	13		0.0 1.5	SPT= 3-6-7	
	0.9		BASE Course (approximately 10 inches)					
	2.5		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist					
			CLAYEY SAND (SC) calcareous , loose to medium dense, tan, slightly moist	12		2.5 4.0	SPT= 3-6-6	
				10		5.0 6.5	SPT= 4-5-5	
	9.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist	12		8.5 10.0	SPT= 4-5-7	
	10.0							
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79959; W 106.41671				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1		ASPHALT (approximately 1 inches)	9		0.0 1.5	SPT= 3-4-5	
	0.8		BASE Course (approximately 9 inches)					
	2.5		FILL: SILTY SAND (SM) loose, reddish-brown, moist					
			CLAYEY SAND (SC) loose, brown to light brown, slightly moist	5		2.5 4.0	SPT= 3-2-3	
	8.0		- with calcareous material	8		5.0 6.5	SPT= 4-4-4	
	10.0		SILTY SAND (SM) loose, brown, slightly moist	6		8.5 10.0	SPT= 2-2-4	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					


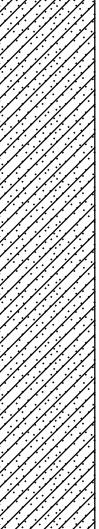
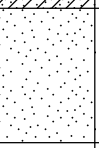
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79928; W 106.4174				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		FILL: SILTY SAND (SM) loose, reddish-brown, moist - topped with gravel at surface	7		0.0 1.5	SPT= 5-4-3	
	8.5		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	20		2.5 4.0	SPT= 34-12-8	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist with trace gravel	13		8.5 10.0	SPT= 4-6-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79929; W 106.41589				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
			FILL: SILTY SAND (SM) loose, reddish-brown, slightly moist	10		0.0 1.5	SPT= 2-5-5	
	3.0			19		2.5 4.0	SPT= 9-11-8	
			CLAYEY SAND (SC) calcareous, loose to medium dense, tan, slightly moist					
	9.0			9		5.0 6.5	SPT= 4-4-5	
				16		8.5 10.0	SPT= 4-7-9	
	10.0		POORLY GRADED SAND (SP) medium dense, brown, slightly moist, with trace gravel and clay					
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					



DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79895; W 106.41741				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist	11		0.0 1.5	SPT= 5-5-6	
	7.5		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	27		2.5 4.0	SPT= 27-17-10	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist	6		5.0 6.5	SPT= 3-3-3	
				19		8.5 10.0	SPT= 6-9-10	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					





DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79895; W 106.41665				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 12-Nov-09 COMPLETED 12-Nov-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	8		0.0	SPT= 4-4-4	
	0.7		BASE Course (approximately 6 inches)			1.5		
			FILL: SILTY SAND (SM) loose, reddish-brown, slightly moist to moist					
	2.5							
			CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	23		2.5	SPT= 13-9-14	
						4.0		
			- loose below 5 feet	7		5.0	SPT= 3-4-3	
						6.5		
	8.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	28		8.5	SPT= 7-12-16	
						10.0		
	10.0							
Boring Terminated								
NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								



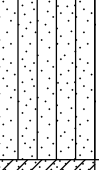
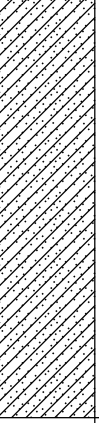
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District		SHEET 1 OF 1 SHEETS		
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.7989; W 106.41592				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-10				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4 UNDISTURBED 0		
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 12-Nov-09 COMPLETED 12-Nov-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	12		0.0 1.5	SPT= 7-7-5	
	0.8		BASE Course (approximately 8 inches)					
	3.0		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist	11		2.5 4.0	SPT= 3-5-6	
	8.0		CLAYEY SAND (SC) calcareous, loose, tan, slightly moist					
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	9		5.0 6.5	SPT= 4-5-4	
				15		8.5 10.0	SPT= 3-7-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					


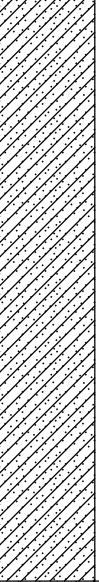

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79861; W 106.41699				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-11				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 11-Nov-09		COMPLETED 11-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		FILL: SILTY SAND (SM) loose, reddish-brown, slightly moist - topped with gravel at surface	8		0.0 1.5	SPT= 4-4-4	
	8.5		CLAYEY SAND (SC) medium dense to dense, tan, slightly moist	32		2.5 4.0	SPT= 14-15-17	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	23		8.5 10.0	SPT= 7-9-14	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79861; W 106.41639				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-12				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 11-Nov-09		COMPLETED 11-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	22		0.0 1.5	SPT= 7-11-11	
	0.7							
			BASE Course (approxiamtely 8 inches)					
			FILL: SILTY SAND (SM) medium dense, reddish-brown, slightly moist					
	2.5							
			CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	22		2.5 4.0	SPT= 4-4-18	
				20		5.0 6.5	SPT= 10-11-9	
	8.0							
			POORLY GRADED SAND (SP) medium dense, slightly moist, with trace gravel	14		8.5 10.0	SPT= 4-5-9	
	10.0							
		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.						


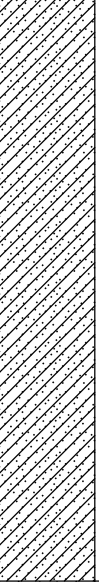

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS			
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)						
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79832; W 106.4173				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL						
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75						
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-13				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0		
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09		
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T						
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i		
			FILL: SILTY SAND (SM) loose, reddish-brown, moist - topped with gravel at surface	7		0.0 1.5	SPT= 2-3-4			
				4		2.5 4.0	SPT= 2-2-2			
				5		5.0 6.5	SPT= 2-2-3			
	9.0					26		8.5 10.0	SPT= 7-12-14	
	10.0				CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist					
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.							



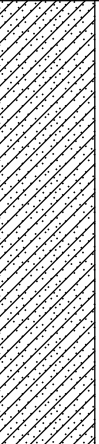
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79834; W 106.41662				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-14				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry		16. DATE HOLE STARTED 11-Nov-09 COMPLETED 11-Nov-09		
7. THICKNESS OF OVERBURDEN (ft) N/A				17. ELEVATION TOP OF HOLE (ft) N/A				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	24		0.0 1.5	SPT= 7-12-12	
	0.8		BASE Course (approximately 8 inches)					
	3.0		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist	47		2.5 4.0	SPT= 4-15-32	
			CLAYEY SAND (SC) dense, tan, slightly moist, calcareous					
	9.0			26		5.0 6.5	SPT= 18-15-11	
	10.0		POORLY GRADED SAND (SP) loose, light brown, slightly moist	9		8.5 10.0	SPT = 3-4-5	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					



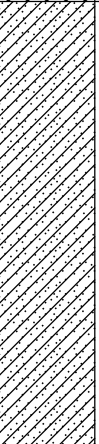
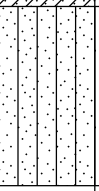
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79835; W 106.41589				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-15				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 12-Nov-09 COMPLETED 12-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	Grab Sample		0.0		
	0.8		BASE Course (approximately 7 inches)			1.5		
			FILL: SILTY SAND (SM) loose, reddish-brown, moist				SPT= 5-3-3	
	3.0				6			
			SILTY SAND (SM) loose, reddish-brown, moist				SPT= 3-5-43	
	5.0							
			CLAYEY SAND (SC) calcareous, very dense, tan, slightly moist, from 5 to 8 feet	48		5.0 6.5	SPT= 4-4-6	
	10.0		- loose, light brown, slightly moist, with calcareous material below 8 feet	10		8.5 10.0		
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79802; W 106.41706				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-16				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 10-Nov-09		COMPLETED 10-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		FILL: SILTY SAND (SM) loose, reddish-brown, moist - topped with gravel at surface	8		0.0 1.5	SPT= 3-4-4	
	9.0		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	18		2.5 4.0	SPT= 10-9-9	
	10.0		POORLY GRADED SAND (SP) medium dense, slightly moist, with trace gravel	13		5.0 6.5	SPT= 7-6-3	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordinates are in NAD 83, in decimal degrees.	18		8.5 10.0	SPT= 4-6-12	

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79797; W 106.41637				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-17				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.3		ASPHALT (approximately 3 inches)	19		0.0 1.5	SPT= 7-11-8	
	1.0		BASE Course (approximately 12 inches)					
	3.0		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist	8		2.5 4.0	SPT= 3-3-5	
	5.0		SILTY SAND (SM) loose, reddish-brown, moist					
	10.0		CLAYEY SAND (SC) calcareous, medium dense, slightly moist	12		5.0 6.5	SPT= 6-6-6	
			- loose below 8.5 feet	9		8.5 10.0	SPT= 5-4-5	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					


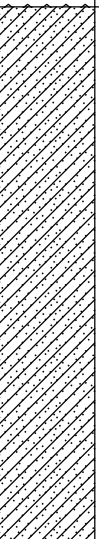
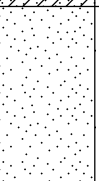
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79773; W 106.41638				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-18				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 12-Nov-09		COMPLETED 12-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	12		0.0 1.5	SPT= 6-7-5	
	9.0		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	16		2.5 4.0	SPT= 13-9-7	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	11		5.0 6.5	SPT= 5-5-6	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	23		8.5 10.0	SPT= 5-9-14	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79824; W 106.41547				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-19				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 13-Nov-09		COMPLETED 13-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	25		0.0 1.5	SPT= 7-10-15	
	0.8		BASE Course (approximately 10 inches)					
	3.0		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist, with trace gravel	5		2.5 4.0	SPT= 2-2-3	
	5.0		SILTY SAND (SM) loose, reddish-brown, moist					
	10.0		CLAYEY SAND (SC) calcareous material, medium dense, brown, slightly moist	11		5.0 6.5	SPT= 4-4-7	
			- loose, below 8.5 feet	7		8.5 10.0	SPT- 4-4-3	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79833; W 106.415				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-20				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 12-Nov-09 COMPLETED 12-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)	20		0.0 1.5	SPT= 5-10-10	
	0.8		BASE Course (approximately 8 inches)					
	3.0		FILL: SILTY SAND (SM) loose, reddish-brown, moist	8		2.5 4.0	SPT= 3-3-5	
	8.0		CLAYEY SAND (SC) calcareous, loose, tan, slightly moist	12		5.0 6.5	SPT= 4-5-7	
	10.0		SILTY SAND (SM) loose, brown, slightly moist, with trace gravel	8		8.5 10.0	SPT= 3-4-4	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79796; W 106.4153				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-21				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 13-Nov-09 COMPLETED 13-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.3		ASPHALT (approximately 3 inches)	25		0.0 1.5	SPT= 8-13-12	
	0.8		BASE Course (approximately 7 inches)					
	3.0		FILL: SILTY SAND (SM) medium dense, reddish-brown, moist, with trace gravel	12		2.5 4.0	SPT= 4-4-8	
	8.5		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	24		5.0 6.5	SPT= 9-12-12	
	10.0		POORLY GRADED SAND (SP) medium dense, light brown, slightly moist	12		8.5 10.0	SPT= 3-6-6	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79774; W 106.4155				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-22				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 13-Nov-09		COMPLETED 13-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		FILL: SILTY SAND (SM) loose, reddish-brown, moist	8		0.0 1.5	SPT= 4-4-4	
			CLAYEY SAND (SC) calcareous, very dense, tan, slightly moist	45		2.5 4.0	SPT= 8-23-24	
	8.5		- medium dense below 5 feet	12		5.0 6.5	SPT= 7-7-5	
	10.0		SILTY SAND (SM) loose, brown, slightly moist, with trace gravel	7		8.5 10.0	SPT= 3-4-3	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT JLENS Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.79771; W 106.41508				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-JLENS-23				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED <input type="checkbox"/> --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 12-Nov-09		COMPLETED 12-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		FILL: SILTY SAND (SM) medium dense, brown to reddish-brown, moist - topped with gravel at surface	17		0.0 1.5	SPT= 10-10-7	
	8.0		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	21		2.5 4.0	SPT= 11-10-11	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	16		5.0 6.5	SPT= 6-8-8	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	15		8.5 10.0	SPT= 5-7-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings - cement grout. 3. Boring location coordiantes are in NAD 83, in decimal degrees.					

APPENDIX B

DYNAMIC CONE PENETROMETER (DCP) TESTING DATA SHEETS

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/3/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	Yes	
Test Location:	10A2S-JLENS-02			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	

(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	125	Datum	-	-	-	-
5	150	25	5	1	5	50
5	225	75	15	1	15	14
5	280	55	11	1	11	20
5	340	60	12	1	12	18
5	380	40	8	1	8	30
5	430	50	10	1	10	20
5	470	40	8	1	8	30
5	510	40	8	1	8	30
5	550	40	8	1	8	30
5	600	50	10	1	10	20
5	670	70	14	1	14	15
5	765	95	19	1	19	11
1	790	25	25	1	25	8
1	810	20	20	1	20	10
1	835	25	25	1	25	8
1	860	25	25	1	25	8
1	880	20	20	1	20	10
1	900	20	20	1	20	10
1	920	20	20	1	20	10
1	950	30	30	1	30	6

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948	Date Tested:	12/3/2009			
Name:	FORT BLISS JLENS BATTERY	Existing HMAC/Flex. Base?	Yes			
Test Location:	10A2S-JLENS-04	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	80	Datum	-	-	-	-
5	140	60	12	1	12	18
5	170	30	6	1	6	40
5	220	50	10	1	10	20
5	265	45	9	1	9	25
5	315	50	10	1	10	20
5	365	50	10	1	10	20
5	430	65	13	1	13	16
5	490	60	12	1	12	18
5	550	60	12	1	12	18
5	605	55	11	1	11	20
5	660	55	11	1	11	20
5	710	50	10	1	10	20
5	760	50	10	1	10	20
5	800	40	8	1	8	30
5	850	50	10	1	10	20
5	900	50	10	1	10	20
5	940	40	8	1	8	30
2	950	10	5	1	5	50
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/2/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-JLENS-08			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	80	Datum	-	-	-	-
1	130	50	50	1	50	4
1	150	20	20	1	20	10
1	160	10	10	1	10	20
5	260	100	20	1	20	10
5	345	85	17	1	17	12
5	425	80	16	1	16	13
5	495	70	14	1	14	15
5	555	60	12	1	12	18
5	620	65	13	1	13	16
5	680	60	12	1	12	18
5	770	90	18	1	18	11
5	915	145	29	1	29	7
4	950	35	9	1	8	30
						-
						-
						-
						-
						-
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948	Date Tested:	12/4/2009			
Name:	FORT BLISS JLENS BATTERY	Existing HMAC/Flex. Base?	Yes			
Test Location:	10A2S-JLENS-10	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	90	Datum	-	-	-	-
5	110	20	4	1	4	60
5	125	15	3	1	3	80
10	150	25	3	1	2	100
10	170	20	2	1	2	100
10	205	35	4	1	3	80
10	225	20	2	1	2	100
10	250	25	3	1	2	100
10	290	40	4	1	4	60
10	320	30	3	1	3	80
10	360	40	4	1	4	60
10	400	40	4	1	4	60
10	440	40	4	1	4	60
10	510	70	7	1	7	35
10	555	45	5	1	4	60
5	610	55	11	1	11	20
5	670	60	12	1	12	18
5	730	60	12	1	12	18
5	810	80	16	1	16	13
5	900	90	18	1	18	11
3	950	50	17	1	16	13

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/4/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	Yes	
Test Location:	10A2S-JLENS-12			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	105	Datum	-	-	-	-
5	140	35	7	1	7	35
5	165	25	5	1	5	50
5	195	30	6	1	6	40
5	235	40	8	1	8	30
5	280	45	9	1	9	25
5	320	40	8	1	8	30
5	350	30	6	1	6	40
10	400	50	5	1	5	50
10	445	45	5	1	4	60
10	490	45	5	1	4	60
10	540	50	5	1	5	50
10	580	40	4	1	4	60
10	630	50	5	1	5	50
10	680	50	5	1	5	50
10	745	65	7	1	6	40
10	825	80	8	1	8	30
10	935	110	11	1	11	20
2	950	15	8	1	7	35
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/2/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-JLENS-13			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	60	Datum	-	-	-	-
1	95	35	35	1	35	5
1	120	25	25	1	25	8
1	145	25	25	1	25	8
1	170	25	25	1	25	8
1	190	20	20	1	20	10
5	270	80	16	1	16	13
5	330	60	12	1	12	18
5	395	65	13	1	13	16
5	450	55	11	1	11	20
5	530	80	16	1	16	13
5	670	140	28	1	28	7
1	710	40	40	1	40	5
1	760	50	50	1	50	4
1	790	30	30	1	30	6
1	825	35	35	1	35	5
1	860	35	35	1	35	5
1	890	30	30	1	30	6
1	920	30	30	1	30	6
1	950	30	30	1	30	6
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/4/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	Yes	
Test Location:	10A2S-JLENS-15			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	120	Datum	-	-	-	-
10	150	30	3	1	3	80
10	170	20	2	1	2	100
10	185	15	2	1	1	100
10	210	25	3	1	2	100
10	230	20	2	1	2	100
10	260	30	3	1	3	80
10	270	10	1	1	1	100
10	285	15	2	1	1	100
10	295	10	1	1	1	100
10	310	15	2	1	1	100
10	330	20	2	1	2	100
10	340	10	1	1	1	100
10	360	20	2	1	2	100
10	380	20	2	1	2	100
10	400	20	2	1	2	100
10	420	20	2	1	2	100
10	440	20	2	1	2	100
						-
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948	Date Tested:	12/4/2009			
Name:	FORT BLISS JLENS BATTERY	Existing HMAC/Flex. Base?	Yes			
Test Location:	10A2S-JLENS-21	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	110	Datum	-	-	-	-
5	150	40	8	1	8	30
10	200	50	5	1	5	50
10	240	40	4	1	4	60
10	260	20	2	1	2	100
10	280	20	2	1	2	100
10	305	25	3	1	2	100
10	320	15	2	1	1	100
10	340	20	2	1	2	100
10	360	20	2	1	2	100
5	370	10	2	1	2	100
10	390	20	2	1	2	100
10	410	20	2	1	2	100
10	430	20	2	1	2	100
10	450	20	2	1	2	100
10	475	25	3	1	2	100
10	500	25	3	1	2	100
10	530	30	3	1	3	80
10	550	20	2	1	2	100
10	570	20	2	1	2	100
10	600	30	3	1	3	80

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cummulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 71948			Date Tested:	12/2/2009	
Name:	FORT BLISS JLENS BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-JLENS-23			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	60	Datum	-	-	-	-
1	75	15	15	1	15	14
5	130	55	11	1	11	20
5	190	60	12	1	12	18
5	240	50	10	1	10	20
5	320	80	16	1	16	13
5	380	60	12	1	12	18
5	420	40	8	1	8	30
5	460	40	8	1	8	30
5	510	50	10	1	10	20
5	555	45	9	1	9	25
5	595	40	8	1	8	30
5	640	45	9	1	9	25
5	690	50	10	1	10	20
5	740	50	10	1	10	20
5	800	60	12	1	12	18
5	860	60	12	1	12	18
5	920	60	12	1	12	18
2	950	30	15	1	15	14
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

APPENDIX C

ADDITIONAL FIELD TESTING DATA



IN-SITU SOIL ELECTRICAL RESISTIVITY TEST REPORT

Using a Nilsson Model 400 Soil Resistance Meter in a Wenner (4-pin) Linear Configuration

PROJECT NUMBER: COE PN 71948 (R-K No. AEA09-060-00)

PROJECT NAME: FORT BLISS JLENS BATTERY

[illegible]

(1) Direction or orientation of test, i.e., N-S, E-W, NE-SW, NW-SE, or lengthwise, widthwise (if the planned building footprint is regularly shaped)

(2) Typical recommended spacing (in feet) is 2, 2.5, 3, 4, 5, 8, 10, 15, and 20

(3) Dial Reading from 0.5 to 11 (large dial)

(4) Sensitivity range from small dial, i.e., 0.01 to 100K

(5) Resistance in Ohms, $R = (3) \cdot (4)$

(6) Resistivity, $\rho=191.5\text{aR}$ per ASTM G57

*

Friday, February 19, 2010

*AM2

FORT BLISS, TEXAS
THAAD BATTERY

GEOTECHNICAL DATA

DECEMBER 2009

Friday, February 19, 2010

Requirements for the Design-Build Contractor's Foundation and Pavement Design Analysis. The successful proposer shall provide a Foundation and Pavement Design Analysis after contract award. The Foundation and Pavement Design Analysis (Report) shall include a description of the project, including a discussion of any unusual features of the project, a discussion for each structure that requires a foundation system, and a discussion of each pavement type. The foundation, pavement, and material analyses shall be performed by and sealed by a licensed professional engineer.

(1) Recommended Foundation System(s). If more than one foundation system is recommended, separate subparagraphs shall be used to discuss each foundation system. The subparagraphs shall provide a detailed description of the foundation system as well as specific design and construction requirements. The location and type of structure supported by that foundation system should also be discussed. Foundation design parameters and considerations should be provided and shall include as a minimum the following items: allowable bearing pressure(s); bearing elevations for each recommended foundation system; a minimum depth the foundation system shall bear below outside finished grade; foundation spacing requirements; foundation structural design methodology to be used; shrink-swell potential of the active subgrade; the design loads used to size the foundation elements; special considerations for deformation sensitive areas such as restrooms or other areas (i.e., tiled areas); a modulus of subgrade reaction; soil unit weights; at-rest and active earth pressure coefficients; anticipated settlement/differential settlement; and applicability (of each of the aforementioned items) to the design.

It is anticipated that a shallow foundation system consisting of reinforced concrete continuous spread and/or spot spread footings will be suitable for the proposed facilities. Footings should bear at a uniform depth, but at least 2.0 feet below outside finish grade. Footings should be sized for an allowable bearing capacity of 2.0 ksf (net). Due to the potential presence of loose sand in the upper 2.5 feet, it is recommended that footings should bear at least 2.5 feet below existing grade, if permitted by site grading requirements. If, due to site grading requirements, footings must be placed at depths shallower than 2.5 feet below existing grade, or if footings must be placed in fill above existing grade, the existing soils below the footings should be removed (excavated) to a depth of 2.5 feet below existing grade. Nonexpansive fill shall then be placed in controlled lifts not exceeding 8 inches in loose thickness and compacted to at least 95 percent of maximum laboratory density as determined in accordance with ASTM D 1557 between the excavation surface and the base of the footings. The earthwork (fill type and compaction) requirements also apply to footings that must be founded in fill above existing grade. Footings founded within fill above existing grade or at depths shallower than 2.5 feet below existing grade, in compliance with the earthwork requirements specified herein, should be sized for an allowable bearing pressure of 2.0 ksf (net). The load used to size the footings should consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent.

Floor slabs placed on-grade should be isolated from any portion of the building structure using 1/2-inch expansion joints. In doing so, the building structure-floor slab interface should be designed to accept vertical movements so that the operation of the facility will not be affected. This will result in the best performance. Transitional areas, such as door openings, can be doweled to prevent offsets from occurring. In these areas, the slab should bear on the grade beam to create a single joint at one face of the grade beam. Slab edges should extend to the outside face of the grade beam at the exterior door locations. A polyethylene vapor barrier (10-mil minimum) should be placed beneath floor slabs supported on-grade; however, a capillary water barrier is not required.

Nonexpansive soils are satisfactory materials having a plasticity index not less than 4 nor greater than 12 when tested in accordance with ASTM D 4518. On-site soils can be used as nonexpansive fill if they meet the aforementioned material definition. Satisfactory materials include materials classified in ASTM D 2487 as GW, GM, GC, GP, SW, SP, SM, SC, CL, and CH and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

(2) Subgrade Preparation. This section shall include a discussion on all requirements for excavation of existing subgrade materials, removal of existing unsuitable materials, replacement of excavated materials with nonexpansive and satisfactory materials, and minimum thickness of nonexpansive fill beneath

building foundations. Provide compaction requirements in accordance with ASTM D 1557 for the raw subgrade, fill, and backfill materials. Foundation and pavement material definitions shall be presented.

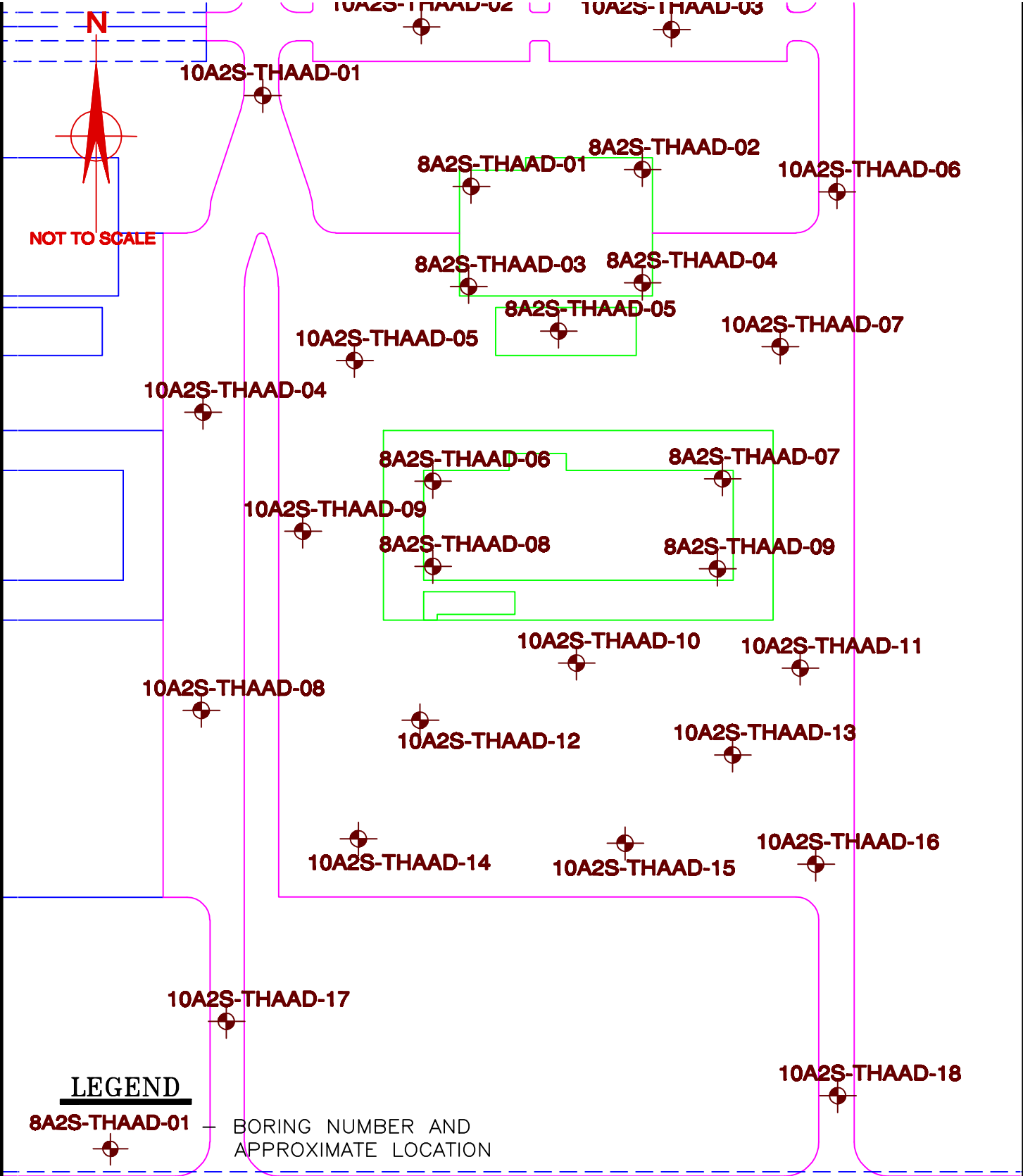
(3) Recommended Pavement Sections. Provide separate subparagraphs for each rigid, flexible (if required), and aggregate-surfaced pavement structure included in the project. Each pavement design shall include as a minimum the following items: traffic types, road classifications and design indexes; subgrade strength values (CBR and modulus of subgrade reaction values for the specified compactive effort); pavement material thicknesses and compaction requirements; and concrete flexural strength for designated time frame. Compaction requirements for pavement material layers shall be in accordance with ASTM D 1557.

(4) Exhibits to be Included in the Design-Build Contractor's Foundation and Pavement Design Analysis. The following exhibits shall be included in the Design-Build contractor's Foundation and Pavement Design Analysis. The Design-Build contractor may use the information provided in this report to satisfy these requirements, or may supplement the information provided herein with additional subsurface drilling and testing, at his option. Required exhibits to be included with the Design-Build contractor's Foundation and Pavement Design Analysis include:

- Site Plan with Boring Locations and Legend;
- Boring Logs;
- Plasticity Chart;
- Standard Penetration Tests versus Depth of Boring (if applicable);
- Moisture Content versus Depth (Chart);
- Moisture Content-Liquid Limit-Plastic Limit versus Depth (Chart);
- Strength Tests Results versus Depth (Chart);
- Tabulation of Laboratory Test Results (to include Boring Number, Sample Number, Depth, Laboratory Classification, Visual Descriptions, Grain Size Analysis (%Gravel, %Sand, %Fines), LL, PL, PI, MC, Unit Weight, and Strength Test Data;
- Consolidation-Expansion Tests/Swell Pressure Tests (if applicable).

APPENDIX A

BORING LOCATIONS & LOGS OF BORINGS



DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS																					
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)																								
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80309; W 106.41377				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL																								
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75																								
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0																				
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A																						
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry																						
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 6-Nov-09		COMPLETED 6-Nov-09																				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A																						
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %																						
				19. GEOLOGIST Carlos Serrano, E.I.T.																								
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i																				
	3.5		SILTY SAND (SM) slightly moist, loose, reddish-brown, slightly moist - topped with gravel at surface	10		0.0 1.5	SPT= 3-4-6																					
	8.0		CLAYEY SAND (SC) calcareous, medium dense, slightly moist	36		2.5 4.0	SPT = 9-17-19																					
				18		5.0 6.5	SPT = 7-8-10																					
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist to dry with trace gravel	15		7.5 9.0	SPT = 5-7-8																					
				26		10.0 11.5	SPT = 4-11-15																					
				30		12.5 14.0	SPT = 7-13-17																					
			- dense to very dense at 15 feet	44		15.0 16.5	SPT = 9-17-27																					
				81		17.5 19.0	SPT = 15-35-46																					
				79		20.0 21.5	SPT= 15-36-43																					
	25.0			81		23.5 25.0	SPT= 19-37-44																					
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees. 4. Surface resistivity measurements per ASTM G57: $r=191.5aR$, where r is soil resistivity (ohms-cm), a is spacing (feet) and R is measured resistance (ohms):																												
<table> <tr> <td>a</td> <td>r</td> </tr> <tr> <td>1</td> <td>15,895</td> </tr> <tr> <td>2</td> <td>14,171</td> </tr> <tr> <td>2.5</td> <td>15,320</td> </tr> <tr> <td>3</td> <td>16,661</td> </tr> <tr> <td>4</td> <td>19,150</td> </tr> <tr> <td>5</td> <td>22,023</td> </tr> <tr> <td>10</td> <td>28,725</td> </tr> <tr> <td>15</td> <td>31,598</td> </tr> <tr> <td>20</td> <td>34,470</td> </tr> </table>				a	r	1	15,895	2	14,171	2.5	15,320	3	16,661	4	19,150	5	22,023	10	28,725	15	31,598	20	34,470					
a	r																											
1	15,895																											
2	14,171																											
2.5	15,320																											
3	16,661																											
4	19,150																											
5	22,023																											
10	28,725																											
15	31,598																											
20	34,470																											

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80312; W 106.41326				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 6-Nov-09 COMPLETED 6-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.0		SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	15		0.0 1.5	SPT= 5-6-8	
	7.0		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	14		2.5 4.0	SPT= 8-7-7	
	9.0		SILTY SAND (SM) medium dense, brown, with trace gravel	14		5.0 6.5	SPT= 5-7-7	
	25.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist to dry, with trace gravel - dense to very dense below 12.5 feet	15		7.5 9.0	SPT= 4-6-9	
				22		10.0 11.5	SPT= 6-10-12	
				43		12.5 14.0	SPT= 8-21-22	
				39		15.0 16.5	SPT= 11-19-20	
				53		17.5 19.0	SPT= 12-25-28	
				54		20.0 21.5	SPT= 15-23-31	
				73		23.5 25.0	SPT= 20-33-40	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80283; W 106.41375				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 3-Nov-09 COMPLETED 3-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	20		0.0 1.5	SPT= 3-9-11	
			CLAYEY SAND (SC) calcareous, medium dense, slightly moist	18		2.5 4.0	SPT= 9-10-8	
	8.0			25		5.0 6.5	SPT= 8-12-13	
			SILTY SAND (SM) loose, brown, slightly moist, with trace gravel	7		7.5 9.0	SPT= 2-3-4	
	12.0			10		10.0 11.5	SPT= 4-5-5	
			POORLY GRADED SAND (SP) dense, light brown to grayish-brown, slightly moist with trace gravel	28		12.5 14.0	SPT= 7-12-16	
				37		15.0 16.5	SPT= 8-16-21	
			- very dense from 17.5 feet	64		17.5 19.0	SPT= 11-27-37	
			- lense clay at 20.5 feet	74		20.0 21.5	SPT= 17-32-42	
	25.0			78/ 10"		23.5 25.0	SPT= 22-38-40/ 4"	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80287; W 106.41325				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 6-Nov-09		COMPLETED 6-Nov-09		
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A		18. TOTAL CORE RECOVERY FOR BORING N/A %		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) medium dense, reddish-brown, slightly moist - topped with gravel at surface	16		0.0 1.5	SPT= 3-8-8	
	7.0		CLAYEY SAND (SC) medium dense, light brown, slightly moist, with calcareous material - calcareous, dense, tan below 5 feet	19		2.5 4.0	SPT= 8-8-11	
	12.0		SILTY SAND (SM) medium dense, brown, slightly moist	47		5.0 6.5	SPT= 15-25-22	
			POORLY GRADED SAND (SP) dense, grayish-brown, dry	12		7.5 9.0	SPT= 7-6-6	
				16		10.0 11.5	SPT= 5-7-9	
				30		12.5 14.0	SPT= 6-12-18	
				39		15.0 16.5	SPT= 8-18-21	
				45		17.5 19.0	SPT= 10-18-27	
			- very dense with trace gravel below 20 feet	59		20.0 21.5	SPT= 12-26-33	
	25.0			74		23.5 25.0	SPT= 16-30-44	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80278; W 106.41344				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 8		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 3-Nov-09 COMPLETED 3-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 20 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) medium dense, reddish-brown, slightly moist - topped with gravel at surface	15		0.0 1.5	SPT= 5-7-8	
			CLAYEY SAND (SC) medium dense, slightly moist - calcareous tan from 2-1/2 to 5 feet	40		2.5 4.0	SPT= 13-19-21	
	7.0		- loose, light brown, with calcareous material below 5 feet	23		5.0 6.5	SPT= 7-12-11	
	8.0		SILTY SAND (SM) loose, light brown, slightly moist, with trace gravel	12		7.5 9.0	SPT= 4-4-8	
			POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist - with trace gravel from 8 to 12.5 feet	19		10.0 11.5	SPT= 3-8-11	
				31		12.5 14.0	SPT= 7-14-17	
				31		15.0 16.5	SPT= 9-13-18	
	20.0			68		18.5 20.0	SPT= 15-29-39	
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.								

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS																					
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)																								
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80238; W 106.41391				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL																								
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75																								
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0																				
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A																						
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry																						
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 3-Nov-09		COMPLETED 3-Nov-09																				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A																						
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %																						
				19. GEOLOGIST Carlos Serrano, E.I.T.																								
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i																				
	4.5		SILTY SAND (SM) loose, reddish-brown, moist - with trace calcareous material below 3 feet	9		0.0 1.5	SPT= 3-5-4																					
	6.5		CLAYEY SAND (SC) medium dense, light brown, slightly moist, with calcareous material	11		2.5 4.0	SPT= 3-6-5																					
	8.0		SILTY SAND (SM) medium dense, light brown, slightly moist	11		5.0 6.5	SPT= 4-4-7																					
			POORLY GRADED SAND (SP) medium dense, slightly moist, grayish-brown - dense with trace gravel from 12.5 to 17 feet	13		7.5 9.0	SPT= 5-7-6																					
				19		10.0 11.5	SPT= 4-8-11																					
				29		12.5 14.0	SPT= 4-12-17																					
				35		15.0 16.5	SPT= 6-17-18																					
				48		17.5 19.0	SPT= 12-21-27																					
			- very dense below 20 feet	67		20.0 21.5	SPT= 13-23-44																					
	25.0			65		23.5 25.0	SPT= 22-33-32																					
Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees. 4. Surface resistivity measurements per ASTM G57: $r=191.5aR$, where r is soil resistivity (ohms-cm), a is spacing (feet) and R is measured resistance (ohms):																												
<table border="0"> <tr> <td>a</td> <td>r</td> </tr> <tr> <td>1</td> <td>13,788</td> </tr> <tr> <td>2</td> <td>13,022</td> </tr> <tr> <td>2.5</td> <td>13,884</td> </tr> <tr> <td>3</td> <td>14,363</td> </tr> <tr> <td>4</td> <td>16,852</td> </tr> <tr> <td>5</td> <td>19,150</td> </tr> <tr> <td>10</td> <td>21,065</td> </tr> <tr> <td>15</td> <td>22,980</td> </tr> <tr> <td>20</td> <td>19,150</td> </tr> </table>				a	r	1	13,788	2	13,022	2.5	13,884	3	14,363	4	16,852	5	19,150	10	21,065	15	22,980	20	19,150					
a	r																											
1	13,788																											
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15	22,980																											
20	19,150																											

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80241; W 106.41303				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 4-Nov-09		COMPLETED 4-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) loose, reddish-brown, - topped with gravel at surface	6		0.0 1.5	SPT= 4-3-3	
	7.0		CLAYEY SAND (SC) loose to medium dense, tan, slightly moist	20		2.5 4.0	SPT= 8-12-8	
				8		5.0 6.5	SPT= 4-4-4	
			POORLY GRADED SAND (SP) light brown to grayish-brown, moist, with trace gravel	15		7.5 9.0	SPT= 4-7-8	
				22		10.0 11.5	SPT= 5-10-12	
				35		12.5 14.0	SPT= 8-16-19	
				38		15.0 16.5	SPT= 9-16-22	
				65		17.5 19.0	SPT= 13-28-37	
				63		20.0 21.5	SPT= 14-29-34	
	25.0			93/ 11.5"		23.5 25.0	SPT= 25-43-50/ 5.5"	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80219; W 106.41393				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09		17. ELEVATION TOP OF HOLE (ft) N/A		
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.5		SILTY SAND (SM) medium dense to dense, reddish-brown, moist - topped with gravel at surface	24		0.0 1.5	SPT= 7-14-10	
			CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	45		2.5 4.0	SPT= 17-24-21	
	8.0			21		5.0 6.5	SPT= 8-11-10	
			SILTY SAND with GRAVEL (SM) medium dense, brown, slightly moist	25		7.5 9.0	SPT= 7-12-13	
	10.0			26		10.0 11.5	SPT= 6-11-15	
			POORLY GRADED SAND with GRAVEL (SP) dense, grayish-brown, slightly moist to dry	58		12.5 14.0	SPT= 15-22-36	
				49		15.0 16.5	SPT= 12-21-28	
	18.0			49		17.5 19.0	SPT= 14-20-29	
			SILTY SAND (SM) very dense, brown, moist	Ref/ 6"		20.0 21.5	SPT= Ref (50)/ 6"	
	23.0							
	25.0		POORLY GRADED SAND (SP) very dense, dry, with trace gravel	75/ 9"		23.5 25.0	SPT= 25-39-36/ 3"	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80217; W 106.41309				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants (SW), Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 8A2S-THAAD-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 10		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES		N/A		
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 4-Nov-09		COMPLETED 4-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft)		N/A		
9. TOTAL DEPTH OF HOLE (ft) 25 (ft)				18. TOTAL CORE RECOVERY FOR BORING		N/A %		
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.0		SILTY SAND (SM) medium dense, brown, slightly moist - topped with gravel at surface	26		0.0 1.5	SPT= 6-13-13	
	5.5		CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	18		2.5 4.0	SPT= 7-8-10	
	9.0		SILTY SAND (SM) medium dense, brown, slightly moist	22		5.0 6.5	SPT= 6-10-12	
			POORLY GRADED SAND with GRAVEL (SP) medium dense, grayish-brown, dry - dense to very dense, with trace gravel below 13 feet	11		7.5 9.0	SPT= 3-5-6	
				16		10.0 11.5	SPT= 3-6-10	
				41		12.5 14.0	SPT= 9-17-24	
				44		15.0 16.5	SPT= 12-18-26	
				56		17.5 19.0	SPT= 16-24-32	
				78		20.0 21.5	SPT= 14-30-48	
	25.0			83/ 10"		23.5 25.0	SPT= 27-42-41/4"	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.803; W 106.4143				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-01				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	20		0.0 1.5	SPT= 4-11-9	
	4.5		CLAYEY SAND (SC) medium dense, light brown, with calcareous material	16		2.5 4.0	SPT= 9-7-9	
	8.5		SILTY SAND (SM) medium dense, light brown, slightly moist, with trace calcareous material	16		5.0 6.5	SPT= 4-7-9	
	10.0		POORLY GRADED SAND (SP) medium dense, brown, slightly moist, with trace gravel	21		8.5 10.0	SPT= 5-9-12	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80341; W 106.41386				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-02				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft)		Dry		
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 5-Nov-09		COMPLETED 5-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
			SILTY SAND (SM) medium dense, brown, slightly moist - topped with gravel at surface	18		0.0 1.5	SPT= 4-8-10	
	3.0			36		2.5 4.0	SPT= 11-18-18	
			CLAYEY SAND (SC) calcareous, dense, brown, dry - medium dense below 5 feet	17		5.0 6.5	SPT= 7-8-9	
	9.0			11		8.5 10.0	SPT= 3-5-6	
	10.0		POORLY GRADED SAND (SP) medium dense, brown, slightly moist, with trace gravel					
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80309; W 106.4136				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-03				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 5-Nov-09 COMPLETED 5-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) medium dense, reddish-brown, moist	15		0.0 1.5	SPT= 2-6-9	
	5.5		CLAYEY SAND (SC) calcareous, dense, reddish-brown, dry	31		2.5 4.0	SPT= 15-19-12	
	9.0		SILTY SAND (SM) medium dense, light brown, slightly moist, with calcareous material	15		5.0 6.5	SPT= 4-7-8	
	10.0		POORLY GRADED SAND (SP) medium dense, brown, slightly moist, with trace gravel	17		8.5 10.0	SPT= 7-7-10	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80269; W 106.41434				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-04				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) medium dense, reddish-brown, moist	21		0.0 1.5	SPT= 8-10-11	
			CLAYEY SAND (SC) dense, light brown, with calcareous material	36		2.5 4.0	SPT= 18-18-18	
			- with trace calcareous material below 5 feet	29		5.0 6.5	SPT= 10-13-16	
	9.0		POORLY GRADED SAND with GRAVEL (SP) medium dense, brown, dry	15		8.5 10.0	SPT= 3-4-11	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80268; W 106.41393				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-05				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.5		SILTY SAND (SM) medium dense, reddish-brown, slightly moist - topped with gravel at surface	13		0.0 1.5	SPT= 4-7-6	
				12		2.5 4.0	SPT= 8-7-5	
	7.5		CLAYEY SAND (SC) medium dense, slightly moist - calcareous, tan from 3.5 to 5 feet - light brown, with calcareous material below 5 feet	20		5.0 6.5	SPT= 4-7-13	
	10.0		POORLY GRADED SAND (SP) grayish-brown, dry, with trace gravel	Grab Sample		8.5 10.0		
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80315; W 106.4129				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-06				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 4-Nov-09 COMPLETED 4-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
			SILTY SAND (SM) loose, reddish-brown - topped with gravel at surface	10		0.0 1.5	SPT= 4-6-4	
	3.5			10		2.5 4.0	SPT= 8-7-3	
			CLAYEY SAND (SC) slightly moist - calcareous, loose, tan from 3.5 to 5 feet - loose, brown, with calcareous material below 5 feet	7		5.0 6.5	SPT= 2-3-4	
	8.5							
			POORLY GRADED SAND (SP) medium dense, grayish brown, moist, with trace gravel	12		8.5 10.0	SPT= 4-5-7	
	10.0							
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80265; W 106.41297				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-07				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 3-Nov-09 COMPLETED 3-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	15		0.0 1.5	SPT= 3-8-7	
	7.0		CLAYEY SAND (SC) calcareous, very dense, tan, dry	51		2.5 4.0	SPT= 22-28-23	
	10.0		SILTY SAND (SM) medium dense, brown, with trace gravel	18		5.0 6.5	SPT= 7-8-10	
				15		8.5 10.0	SPT= 5-6-9	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80198; W 106.41436				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-08				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) medium dense, brown, slightly moist	30		0.0 1.5	SPT= 8-13-17	
	5.0		CLAYEY SAND (SC) medium dense, light brown, with calcareous material	28		2.5 4.0	SPT= 9-14-14	
	9.0		SILTY SAND (SM) medium dense, light brown, with trace calcareous material	11		5.0 6.5	SPT= 6-4-7	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, dry, with trace gravel	16		8.5 10.0	SPT= 3-6-10	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80232; W 106.4141				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-09				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) medium dense, reddish-brown, moist - topped with gravel at surface	19		0.0 1.5	SPT= 6-11-8	
			CLAYEY SAND (SC) calcareous, medium dense, tan - slightly moist from 2 to 5 feet	17		2.5 4.0	SPT= 11-10-7	
			- medium dense, light brown, slightly moist, with calcareous material below 5 feet	15		5.0 6.5	SPT= 6-7-8	
	9.0		POORLY GRADED SAND (SP) brown, slightly moist, with dense, trace gravel	31		8.5 10.0	SPT= 8-13-18	
	10.0		Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					


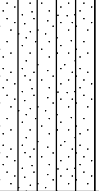

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80206; W 106.41357				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-10				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 4-Nov-09 COMPLETED 4-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.5		SILTY SAND (SM) medium dense, reddish-brown, moist	21		0.0 1.5	SPT= 4-9-12	
			CLAYEY SAND (SC) medium dense, slightly moist - calcareous, tan, from 2.5 to 5 feet - light brown, with calcareous material below 5 feet	29		2.5 4.0	SPT= 9-14-15	
	8.0			20		5.0 6.5	SPT= 6-9-11	
	10.0		SILTY SAND (SM) medium dense, light brown, slightly moist, with trace calcareous material and gravel	17		8.5 10.0	SPT= 8-9-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					


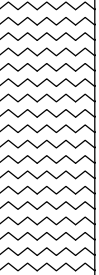

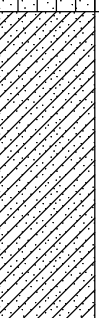
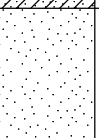
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80202; W 106.41293				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-11				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 4-Nov-09 COMPLETED 4-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.5		SILTY SAND (SM) medium dense, brown, moist - topped with gravel at surface	19		0.0 1.5	SPT= 7-11-8	
				35		2.5 4.0	SPT= 16-21-14	
	9.0		CLAYEY SAND (SC) medium dense - calcareous, tan, dry from 3.5 to 5 feet - light brown, with calcareous material below 5 feet	20		5.0 6.5	SPT= 9-10-10	
	10.0		SILTY SAND (SM) medium dense, brown, slightly moist, with trace gravel	13		8.5 10.0	SPT= 5-5-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80194; W 106.41395				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-12				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 2-Nov-09 COMPLETED 2-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
			SILTY SAND (SM) medium dense, brown, moist - topped with gravel at surface	22		0.0 1.5	SPT= 8-11-11	
	3.0			58		2.5 4.0	SPT= 21-36-22	
			CLAYEY SAND (SC) - calcareous, very dense, dry from 3 to 5.5 feet - medium dense, slightly moist, with	13		5.0 6.5	SPT= 7-7-6	
	9.0			15		8.5 10.0	SPT= 5-6-9	
	10.0		POORLY GRADED SAND (SP) grayish-borwn, dry, with trace gravel					
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

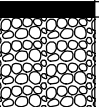
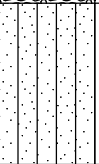
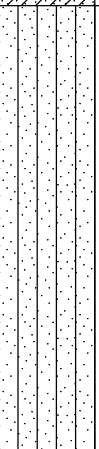
DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80176; W 106.41316				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-13				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 4-Nov-09		COMPLETED 4-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	2.0		SILTY SAND (SM) loose, reddish-brown, slightly moist - topped iwth gravel at surface	9		0.0 1.5	SPT= 4-5-4	
	8.0		CLAYEY SAND (SC) calcareous, dense - tan from 2 to 5 feet - medium dense, brown, with calcareous material 5 feet	31		2.5 4.0	SPT= 18-17-14	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, dry, with trace gravel	14		5.0 6.5	SPT= 7-7-7	
				18		8.5 10.0	SPT= 5-8-10	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80163; W 106.41404				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-14				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE		STARTED 5-Nov-09		COMPLETED 5-Nov-09
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	3.5		SILTY SAND (SM) medium dense, brown, slightly moist	26		0.0 1.5	SPT= 7-14-12	
				50/ 6"		2.5 4.0	SPT= 39-50/6"	
	8.5		CLAYEY SAND (SC) calcareous, very dense, brown, slightly moist - medium dense below 5 feet	25		5.0 6.5	SPT= 6-11-14	
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trave gravel	23		8.5 10.0	SPT= 7-11-12	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS		
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)					
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80157; W 106.41352				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL					
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75					
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-15				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0	
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A					
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry					
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 5-Nov-09 COMPLETED 5-Nov-09					
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A					
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %					
				19. GEOLOGIST Carlos Serrano, E.I.T.					
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i	
	0.2		ASPHALT (approximately 2 inches)						
	0.8		BASE Course (approximately 7 inches)						
			SILTY SAND (SM) medium dense, reddish-brown, moist	15		1.0 2.5	SPT= 4-9-6		
	3.0				7		2.5 4.0	SPT= 3-3-4	
			CLAYEY SAND (SC) loose, brown, moist, with trace calcareous material						
			- medium dense, below 5 feet	13		5.0 6.5			SPT= 3-6-7
	10.0		- with calcareous material below 3.5 feet	16		8.5 10.0			SPT= 4-7-9
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.						

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80155; W 106.4129				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-16				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 6-Nov-09 COMPLETED 6-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.1		ASPHALT (approximately 1.5 inches)				SPT= 3-4-6	
	0.8		BASE Course (approximately 8 inches)					
			FILL: SILTY SAND (SM) loose, reddish-brown, moist	10		1.0 2.5		
	4.0			7		2.5 4.0		
	5.0		SILTY SAND (SM) reddish-brown, moist				SPT= 9-7-6	
			CLAYEY SAND (SC) calcareous, medium dense, tan, slightly moist	13		5.0 6.5		
	8.5							
	10.0		POORLY GRADED SAND (SP) medium dense, brown, slightly moist, with trace gravel	18		8.5 10.0	SPT= 5-7-11	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80117; W 106.41444				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-17				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 5-Nov-09 COMPLETED 5-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)					
	1.0		BASE Course (approximately 8 inches)					
	2.0		FILL: SILTY SAND (SM) loose, reddish-brown, very moist	10		1.0 2.5	SPT= 3-3-7	
	3.0		SILTY SAND (SM) medium dense, reddish-brown, moist	13		2.5 4.0	SPT= 6-6-7	
			CLAYEY SAND (SC) - calcareous, medium dense, tan, slightly moist from 3 to 5 feet					
			- loose, light brown, slightly moist, with calcareous material below 5 feet	10		5.0 6.5	SPT= 5-5-5	
	9.0							
	10.0		POORLY GRADED SAND (SP) medium dense, grayish-brown, slightly moist, with trace gravel	13		8.5 10.0	SPT= 4-5-8	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

DRILLING LOG		DIVISION Southwestern		INSTALLATION Fort Worth District			SHEET 1 OF 1 SHEETS	
1. PROJECT THAAD Battery				10. SIZE AND TYPE OF BIT Carbide H.S. Auger Bit (7" O.D.)				
2. LOCATION (Coordinates or Station) Fort Bliss, Texas; N 31.80091; W 106.41275				11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY Raba-Kistner Consultants, Inc.				12. MANUFACTURER'S DESIGNATION OF DRILL CME-75				
4. HOLE NO. (As shown on drawing title and file number) 10A2S-THAAD-18				13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 4		UNDISTURBED 0
5. NAME OF DRILLER Derek Duenez				14. TOTAL NUMBER CORE BOXES N/A				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.				15. ELEVATION GROUND WATER (ft) Dry				
7. THICKNESS OF OVERBURDEN (ft) N/A				16. DATE HOLE STARTED 5-Nov-09 COMPLETED 5-Nov-09				
8. DEPTH DRILLED INTO ROCK (ft) N/A (ft)				17. ELEVATION TOP OF HOLE (ft) N/A				
9. TOTAL DEPTH OF HOLE (ft) 10 (ft)				18. TOTAL CORE RECOVERY FOR BORING N/A %				
				19. GEOLOGIST Carlos Serrano, E.I.T.				
ELEVATION (feet-MSL) a	DEPTH (feet) b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	BLOW COUNT e	% RECOVERY f	SAMPLE INTERVAL g	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) h	COMPOSITE SAMPLE INTERVAL i
	0.2		ASPHALT (approximately 2 inches)				SPT= 6-8-8	
	1.2		BASE Course (approximately 12 inches)			1.0 2.5		
	3.0		SILTY SAND (SM) medium dense, reddish-brown, very moist	16		2.5 4.0	SPT= 3-4-4	
	5.0		CLAYEY SAND (SC) loose, light brown, moist, with calcareous material	8				
	10.0		SILTY SAND (SM) loose, reddish-brown, moist	9		5.0 6.5	SPT= 3-4-5	
				14		8.5 10.0	SPT= 6-7-7	
			Boring Terminated NOTES: 1. Free water was not observed during drilling operations. 2. Backfilled with soil cuttings-cement grout. 3. Boring location coordinates in NAD 83, in decimal degrees.					

APPENDIX B

DYNAMIC CONE PENETROMETER (DCP) TESTING DATA SHEETS

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665	Date Tested:	12/2/2009			
Name:	FORT BLISS THAAD BATTERY	Existing HMAC/Flex. Base?	No			
Test Location:	10A2S-THAAD-02	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	60	Datum	-	-	-	-
1	125	65	65	1	65	3
1	170	45	45	1	45	4
1	205	35	35	1	35	5
1	235	30	30	1	30	6
1	260	25	25	1	25	8
1	280	20	20	1	20	10
1	300	20	20	1	20	10
5	370	70	14	1	14	15
5	440	70	14	1	14	15
5	480	40	8	1	8	30
5	510	30	6	1	6	40
10	570	60	6	1	6	40
10	640	70	7	1	7	35
10	720	80	8	1	8	30
5	770	50	10	1	10	20
5	820	50	10	1	10	20
5	855	35	7	1	7	35
5	890	35	7	1	7	35
5	925	35	7	1	7	35
5	950	25	5	1	5	50

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cummulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665			Date Tested:	12/2/2009	
Name:	FORT BLISS THAAD BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-THAAD-05			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	

(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	60	Datum	-	-	-	-
1	120	60	60	1	60	3
1	155	35	35	1	35	5
2	220	65	33	1	32	6
2	270	50	25	1	25	8
2	310	40	20	1	20	10
1	340	30	30	1	30	6
1	370	30	30	1	30	6
1	410	40	40	1	40	5
1	445	35	35	1	35	5
2	500	55	28	1	27	7
5	550	50	10	1	10	20
10	585	35	4	1	3	80
10	615	30	3	1	3	80
10	665	50	5	1	5	50
10	710	45	5	1	4	60
10	750	40	4	1	4	60
10	790	40	4	1	4	60
10	830	40	4	1	4	60
10	900	70	7	1	7	35
6	950	50	8	1	8	30

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665	Date Tested:	12/2/2009			
Name:	FORT BLISS THAAD BATTERY	Existing HMAC/Flex. Base?	No			
Test Location:	10A2S-THAAD-07	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	60	Datum	-	-	-	-
1	110	50	50	1	50	4
1	140	30	30	1	30	6
1	165	25	25	1	25	8
1	190	25	25	1	25	8
5	270	80	16	1	16	13
5	360	90	18	1	18	11
10	570	210	21	1	21	10
10	640	70	7	1	7	35
10	690	50	5	1	5	50
10	720	30	3	1	3	80
10	730	10	1	1	1	100
10	750	20	2	1	2	100
10	760	10	1	1	1	100
10	790	30	3	1	3	80
10	820	30	3	1	3	80
10	840	20	2	1	2	100
10	865	25	3	1	2	100
10	890	25	3	1	2	100
10	920	30	3	1	3	80
10	950	30	3	1	3	80

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665	Date Tested:	12/2/2009			
Name:	FORT BLISS THAAD BATTERY	Existing HMAC/Flex. Base?	No			
Test Location:	10A2S-THAAD-08	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	70	Datum	-	-	-	-
1	100	30	30	2	60	3
1	130	30	30	2	60	3
5	190	60	12	2	24	8
5	240	50	10	2	20	10
5	285	45	9	2	18	11
5	340	55	11	2	22	9
5	420	80	16	2	32	6
10	460	40	4	2	8	30
10	490	30	3	2	6	40
5	510	20	4	1	4	60
10	545	35	4	1	3	80
10	580	35	4	1	3	80
10	625	45	5	1	4	60
10	680	55	6	1	5	50
10	725	45	5	1	4	60
10	760	35	4	1	3	80
10	800	40	4	1	4	60
10	835	35	4	1	3	80
10	890	55	6	1	5	50
10	950	60	6	1	6	40

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665			Date Tested:	12/2/2009	
Name:	FORT BLISS THAAD BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-THAAD-09			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	60	Datum	-	-	-	-
1	105	45	45	1	45	4
2	180	75	38	1	37	5
2	230	50	25	1	25	8
5	320	90	18	1	18	11
10	485	165	17	1	16	13
10	560	75	8	1	7	35
10	610	50	5	1	5	50
10	650	40	4	1	4	60
10	680	30	3	1	3	80
10	720	40	4	1	4	60
10	760	40	4	1	4	60
10	790	30	3	1	3	80
10	825	35	4	1	3	80
10	840	15	2	1	1	100
10	860	20	2	1	2	100
10	875	15	2	1	1	100
10	900	25	3	1	2	100
10	920	20	2	1	2	100
10	935	15	2	1	1	100
10	950	15	2	2	3	80

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665			Date Tested:	12/2/2009	
Name:	FORT BLISS THAAD BATTERY			Existing HMAC/Flex. Base?	No	
Test Location:	10A2S-THAAD-11			Water Table Depth:	n/a ft	
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.			Soil Type:	See Boring Log	
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	60	Datum	-	-	-	-
1	110	50	50	1	50	4
1	140	30	30	1	30	6
1	170	30	30	1	30	6
5	240	70	14	1	14	15
5	310	70	14	1	14	15
5	410	100	20	1	20	10
5	475	65	13	1	13	16
5	530	55	11	1	11	20
5	580	50	10	1	10	20
5	640	60	12	1	12	18
5	740	100	20	1	20	10
1	760	20	20	1	20	10
1	790	30	30	1	30	6
1	810	20	20	1	20	10
1	840	30	30	1	30	6
1	865	25	25	1	25	8
10	900	35	4	1	3	80
10	930	30	3	1	3	80
10	950	20	2	1	2	100
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665	Date Tested:	12/2/2009			
Name:	FORT BLISS THAAD BATTERY	Existing HMAC/Flex. Base?	No			
Test Location:	10A2S-THAAD-12	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			
(1) Number of Blows	(2) Cumulative Penetration / Reading (mm)	(3) Penetration Between Readings (mm)	(4) Penetration per Blow Count (mm)	(5) Hammer Blow Factor	(6) DCP Index (mm/blow)	(7) CBR (%)
0	65	Datum	-	-	-	-
1	100	35	35	1	35	5
1	125	25	25	1	25	8
1	145	20	20	1	20	10
5	190	45	9	2	18	11
5	240	50	10	2	20	10
5	280	40	8	2	16	13
5	325	45	9	2	18	11
5	375	50	10	2	20	10
5	430	55	11	2	22	9
5	470	40	8	2	16	13
10	510	40	4	2	8	30
10	550	40	4	2	8	30
10	590	40	4	2	8	30
5	630	40	8	2	16	13
10	670	40	4	2	8	30
10	690	20	2	2	4	60
						-
						-
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

DYNAMIC CONE PENETROMETER DATA SHEET						
Project No.:	PN 72665	Date Tested:	12/3/2009			
Name:	FORT BLISS THAAD BATTERY	Existing HMAC/Flex. Base?	Yes			
Test Location:	10A2S-THAAD-15	Water Table Depth:	n/a ft			
Drilling Agency:	RABA-KISTNER CONSULTANTS (SW), INC.	Soil Type:	See Boring Log			

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Blows	Cummulative Penetration / Reading (mm)	Penetration Between Readings (mm)	Penetration per Blow Count (mm)	Hammer Blow Factor	DCP Index (mm/blow)	CBR (%)
0	105	Datum	-	-	-	-
5	135	30	6	1	6	40
10	180	45	5	1	4	60
10	230	50	5	1	5	50
10	280	50	5	1	5	50
10	340	60	6	1	6	40
10	400	60	6	1	6	40
10	485	85	9	1	8	30
10	545	60	6	1	6	40
10	610	65	7	1	6	40
10	690	80	8	1	8	30
10	800	110	11	1	11	20
5	890	90	18	1	18	11
4	950	60	15	1	15	14
						-
						-
						-
						-
						-
						-
						-

- (1) Number of hammer blows between test readings
 (2) Cumulative penetration after each set of hammer blows, scale reading
 (3) Difference in cumulative penetration between readings (actual soil penetration)
 (4) (3) Divided by (1)
 (5) Enter 1 for 8-kg (17.6-lb) hammer; 2 for 4.6-kg (10.1lb) hammer
 (6) (4) X (5)
 (7) From CBR versus DCP correlation table ASTM D6951-03

APPENDIX C

ADDITIONAL FIELD TESTING DATA



IN-SITU SOIL ELECTRICAL RESISTIVITY TEST REPORT

Using a Nilsson Model 400 Soil Resistance Meter in a Wenner (4-pin) Linear Configuration

PROJECT NUMBER: COE PN 72665 (R-K No. AEA09-060-00)

PROJECT NAME: FORT BLISS THAAD BATTERY

[illegible]

(1) Direction or orientation of test, i.e., N-S, E-W, NE-SW, NW-SE, or lengthwise, widthwise (if the planned building footprint is regularly shaped)

(2) Typical recommended spacing (in feet) is 2, 2.5, 3, 4, 5, 8, 10, 15, and 20

(3) Dial Reading from 0.5 to 11 (large dial)

(4) Sensitivity range from small dial, i.e., 0.01 to 100K

(5) Resistance in Ohms, $R = (3) \cdot (4)$

(6) Resistivity, $\rho=191.5\text{aR}$ per ASTM G57

*

Friday, February 19, 2010

APPENDIX B
LIST OF DRAWINGS
NOT USED

APPENDIX C

UTILITY CONNECTIONS

SEE APPENDIX J – DRAWINGS

APPENDIX D

RESULTS OF FIRE FLOW TESTS

***AM1 THAAD, JLENS AND SUSTAINMENT
BRIGADE FIRE PROTECTION AUTOMATIC
SPRINKLER FIRE SYSTEMS STUDY
FORT BLISS, TEXAS**

For:



**U.S. ARMY CORPS OF ENGINEERS
FT. WORTH DISTRICT**

JACOBS / HUITT-ZOLLARS

November 6, 2009



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SECTION 1.0 – INTRODUCTION AND BACKGROUND

1.1 – OBJECTIVE

The objective of this study is to analyze the existing water services to the THAAD, JLENS and the Sustainment Brigade Facilities sites for proposed and future building fire suppression system requirements. The study will include verification of the existing, proposed (Phase 1) and future water flow and pressure requirements for automatic sprinklers throughout the proposed and future COF's, TEMF's and Deploy Storage Buildings located on these sites. This study will utilize the fire hydrant flow tests data and calculations necessary to evaluate available water at each site. This study will determine whether fire pump(s) and ground water storage reservoir(s) will be required to provide adequate fire flow and pressure for automatic sprinkler systems within the buildings. In addition, this study will determine the availability and capacity of electrical power for fire pump(s).

This study will include schematic site drawings to indicate flow test locations, proposed locations of fire pump(s), ground storage water tanks and proposed distribution and service mains to proposed and future buildings. In addition, drawings will indicate where electrical power for fire pump houses will be supplied from.

1.2 – PROJECT INFORMATION

Fort Bliss is located in Texas near the City of El Paso. The approximate latitude, longitude coordinates of the site are 106°23' West and 31°49' North. The approximate elevation of Fort Bliss is 4000 ft.

This project consists of three sites, THAAD, JLENS and the Sustainment Brigade Facility all located within the Main Cantonment Area. THAAD and JLENS are located adjacent to one another and the Sustainment Brigade Facility is located away from the others. New TEMF's, COF's and Storage buildings are proposed for these sites.

This study will address whether the existing water supply to the three sites can support automatic sprinkler fire protection in the proposed Phase 1 and future buildings planned to be added to these sites. This study will also address if fire booster pumps or ground storage water tanks with fire pumps will be required.



SECTION 2.0 – EXISTING CONDITIONS AND CONSTRAINTS

2.1 – *EXISTING WATER DISTRIBUTION*

Each site has access to existing water mains with fire hydrants near the proposed project sites. These mains are intended to be used as fire water service for the automatic sprinkler systems in the proposed (Phase 1) and future buildings.

Most of the existing distribution mains are very old asbestos cement (AC) pipe with some dating back to the late 1950's. Old asbestos cement mains tend to have poor flow characteristics after several years of service. In addition, most of the distribution mains throughout these areas are 8 inch and less in diameter. When these mains were installed, very few if any buildings had automatic sprinkler protection and distribution mains were basically designed for domestic water supply only. The present automatic sprinkler systems of the proposed and future buildings located on these three sites will have high fire hazard design requirements and will require more than 6 times the present water demand.

The Texas Commission on Environmental Quality TCEQ requires that the automatic sprinkler system combined with outside fire hose demand can not reduce the domestic water supply main residual pressure below 20 psi. If this cannot be accomplished, a ground storage water tank will be required.

2.2 – *THAAD AND JLENS SITES FLOW TESTS ON EXISTING MAINS*

The THAAD site has an existing looped 8 inch asbestos cement water main in Pershing Road running along the south side of the proposed project site (See attached Drawing FT-1, Appendix C). Two hydrants have been tested and the Fire Flow Tests results are as follows:

Fire Flow Test #1A

Hydrant Tested: #5800-26

Street: Pershing Road (East of Abernethy)

Date of Test: 09-11-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"



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Static Pressure: 50 psi

Residual Pressure: 26 psi

Pitot Pressure: 15 psi

Flow: 650 gpm

Flow @ 20 psi: 733 gpm

Fire Flow Test #1B

Hydrant Tested: #5800-27

Street: Pershing Road (East of Abernethy)

Date of Test: 09-11-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 50 psi

Residual Pressure: 26 psi

Pitot Pressure: 12 psi

Flow: 581 gpm

Flow @ 20 psi: 656 gpm

The JLENS site has existing water mains on two sides of the site (See attached Drawing FT-1, Appendix C). Existing looped 8 inch asbestos cement water mains run along the north side of the proposed project site in Pershing Road and on the west side of the proposed project site in Abernethy Street. The results of fire flow tests on the two hydrants off the 8 inch main in Pershing Road are indicated above (Fire Flow Test #1A and #1B). The fire flow tests results off the two hydrants tested in Abernethy Street are as follows:

Fire Flow Test #2A:

Hydrant Tested: #5800-35

Street: Abernethy Street (South of Pershing)

Date of Test: 09-11-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 52 psi

Residual Pressure: 31 psi

Pitot Pressure: 20 psi



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Fort Bliss Transformation

Flow: 750 gpm

Flow @ 20 psi: 942 gpm

Fire Flow Test #2B

Hydrant Tested: #5800-36

Street: Abernethy Street (South of Pershing)

Date of Test: 09-11-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 50 psi

Residual Pressure: 26 psi

Pitot Pressure: 18 psi

Flow: 712 gpm

Flow @ 20 psi: 803 gpm

The water distribution mains that supply the THAAD and JLENS sites are supplied by an existing 1.5 Million Gallon Elevated Water Storage Tank (# 5301) located east off JEB Stuart Road. This elevated tank supplies a 16 inch concrete steel cylinder (CSC) supply main that connects into a looped 16 inch CSC distribution main that runs north and south in JEB Stuart Road. This 16 inch main supplies a looped 8 inch AC water main that runs east and west in Pershing Road that supply flow tested Fire Hydrants #5800-26 and #5800-27. The 16 inch supply main from the Elevated Water Storage Tank #5301 has Fire hydrant #5300-15 in the line. The result of fire flow test on Fire Hydrant #5300-15 is indicated below (Fire Flow Test #3) as follows:

Fire Flow Test # 3

Hydrant Tested: #5300-15

Street: JEB Stuart Road (Near and West of Elevated Tank #5301)

Date of Test: 10-20-2009

Size and Type of Main: 16" CSC

Outlet Nozzle: 2-1/2"

Static Pressure: 54 psi

Residual Pressure: 40 psi

Pitot Pressure: 35 psi



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of Engineers
Fort Worth District

Flow: 993 gpm

Flow @ 20 psi: 1603 gpm

Fort Bliss Water Service Company Flow Test Reports at the THAAD and JLENS sites are found in Appendix A.

2.3 – SUSTAINMENT BRIGADE SITE FLOW TESTS ON EXISTING MAINS

The Sustainment Brigade site has existing water mains on three sides (See attached Drawing FT-2, Appendix C). Existing looped 8 inch AC water mains run along the north side of the proposed project site in Haan Road and on the south side of the proposed project site in Stennis Street. The largest main is an existing looped 14 inch CSC water main running along the west side of the proposed project site in Carrington Road. The fire flow tests results off the two hydrants tested in Carrington Road are as follows:

Fire Flow Test #4A:

Hydrant Tested: #2900-06

Street: Carrington Road (Between Haan & Stennis)

Date of Test: 10-16-2009

Size and Type of Main: 14" CSC

Outlet Nozzle: 2-1/2"

Static Pressure: 60 psi

Residual Pressure: 38 psi

Pitot Pressure: 37 psi

Flow: 1021 gpm

Flow @ 20 psi: 1410 gpm

Fire Flow Test #4B

Hydrant Tested: #2900-07

Street: Carrington Road (Between Haan & Stennis)

Date of Test: 10-16-2009

Size and Type of Main: 14" CSC

Outlet Nozzle: 2-1/2"

Static Pressure: 60 psi



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Residual Pressure: 40 psi

Pitot Pressure: 37 psi

Flow: 1021 gpm

Flow @ 20 psi: 1484 gpm

The fire flow test results off the two hydrants tested in Haan Road are as follows:

Fire Flow Test #5A:

Hydrant Tested: #2900-09

Street: Haan Road (Between Carrington & Cramer)

Date of Test: 10-14-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 64 psi

Residual Pressure: 54 psi

Pitot Pressure: 50 psi

Flow: 1186 gpm

Flow @ 20 psi: 2641 gpm

Fire Flow Test #5B

Hydrant Tested: #2900-10

Street: Haan Road (Between Carrington & Cramer)

Date of Test: 10-14-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 64 psi

Residual Pressure: 56 psi

Pitot Pressure: 40 psi

Flow: 1061 gpm

Flow @ 20 psi: 2664 gpm



The fire flow test results off the two hydrants tested in Stennis Street are as follows:

Fire Flow Test #6A:

Hydrant Tested: #2900-22

Street: Stennis Street (Between Carrington & Cramer)

Date of Test: 10-14-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 50 psi

Residual Pressure: 40 psi

Pitot Pressure: 35 psi

Flow: 993 gpm

Flow @ 20 psi: 1797 gpm

Fire Flow Test #6B

Hydrant Tested: #2900-23

Street: Stennis Street (Between Carrington & Cramer)

Date of Test: 10-14-2009

Size and Type of Main: 8" AC

Outlet Nozzle: 2-1/2"

Static Pressure: 50 psi

Residual Pressure: 40 psi

Pitot Pressure: 30 psi

Flow: 919 gpm

Flow @ 20 psi: 1663 gpm

Fort Bliss Water Service Company Flow Test Reports at the Sustainment Brigade site are found in Appendix A.

2.4 – ELECTRICAL REQUIREMENTS

Proposed electric power for the THAAD and JLENS site fire suppression pump system will be available from a 13.2 KV switch to be installed as part of the JLENS project. The switch will be located south of Pershing Road and east of Abernethy Street. See attached Drawing FT-1 for



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primary power switch location. Power shall be routed from the 13.2 KV switch underground to a 45 KVA 13.2KV to 208Y/120V pad mounted transformer at the fire pump location. The transformer shall include fuse protection on the primary side. The transformer shall supply a 125 amp panelboard mounted on the fire pump foundation pad. Circuit breakers on the panelboard shall supply the fire pump, fire alarm control panel, fire alarm transmitter, and a transient voltage surge suppression panel.

Proposed electric power for the Sustainment Brigade Facility site is available from a 13.2 KV overhead power line that runs west and east on the south side of Haan Road to the intersection with Cramer Street. See attached drawing FT-2 for primary power overhead line and pole location. Fused cutouts shall be provided at the 13.2 KV riser pole. 13.2 KV power shall be routed from the riser pole underground to a 45 KVA 13.2 KV to 208Y/120V pad mounted transformer at the fire pump location. The transformer shall include fuse protection on the primary side. The transformer shall supply a 125 amp panelboard mounted on the fire pump foundation pad. Circuit breakers on the panelboard shall supply the fire pump, fire alarm control panel, fire alarm transmitter, and a transient voltage surge suppression panel.

2.5 – CRITERIA

The following Codes and Standards apply to the Fire Protection System design and construction:

- UFC 3-600-01 Unified Facilities Criteria "Fire Protection Engineering for Facilities" 9-26-2009
- NFPA 13-2010, National Fire Protection Association "Installation of Sprinkler Systems"
- NFPA 20-2010, National Fire Protection Association "Installation of Stationary Pumps"
- NFPA 22-2010, National Fire Protection Association "Water Tanks for Private Fire Protection"
- NFPA 24-2010, National Fire Protection Association "Private Fire Service Mains"
- NFPA 70-2008, National Fire Protection Association "National Electrical Code"
- NFPA 70E-2004, National Fire Protection Association "Standard for Electrical Safety in the Workplace"



SECTION 3.0 – PROPOSED AND FUTURE FACILITIES AND HAZARD PROJECTIONS

3.1 –HAZARD PROJECTIONS

The three proposed sites THAAD, JLENS and the Sustainment Brigade Facilities will all have new COF's, TEMF's and Deploy Storage Buildings locations. All of these buildings will be fully fire sprinkled with the hydraulically most demanding water requirement basis of design as follows:

COF: Design hazard is based on a wet type automatic sprinkler system at Ordinary Hazard Group 2 with a design density of 0.20 gpm/sf over the hydraulically most remote 3000 sf. Water supply demand is 1920 gpm at 20 psi. Water supply duration is 60 minutes.

TEMF: Miscellaneous Rack Storage of Class IV Commodities stored in open racks 12 feet high or less. Design hazard is based on a wet type automatic sprinkler system at Extra Hazard Group 2 with a design density of 0.30 gpm/sf over the hydraulically most remote 3000 sf. Water supply demand is 1920 gpm at 20 psi for a duration of 120 minutes.

Deploy Storage Building: Miscellaneous Floor Storage of Class IV Commodities stored on floor up to 8 feet high or less. Design hazard is based on a dry type automatic sprinkler system at Ordinary Hazard Group 2 with a design density of 0.20 gpm/sf over the hydraulically most remote 3900 sf. Water supply demand duration is 60 minutes.

The highest hazard requiring the greatest fire flow demand are the TEMF's.



SECTION 4.0 – AUTOMATIC SPRINKLER CALCULATIONS

Calculations are based on 8 inch minimum PVC C900 pipe fire pump suction with proposed and future fire water distribution mains throughout each site and service to each building. Also, the calculations are based on the TEMF facilities, which are the highest hazard and require the greatest flow and pressure demand.

For Fire Protection Automatic Sprinkler Calculations of the COF, TEMF and Deploy Storage see Appendix B.

4.1 –TYPICAL COF, DEPLOY STORAGE AND TEMF

The first three sets of calculations are typical COF, Deploy Storage and TEMF Calculations which indicate the typical required demand for each specific building without a fire pump. This is based on a minimum piping friction loss in both the exterior and interior of the building.

4.2 –THAAD AND JLENS TEMF WITH PUMP AND GROUND STORAGE TANK

The next set of calculations is based on the THAAD and JLENS site for the TEMF which is the highest hazard of the buildings with fire pump and ground storage tank. This calculation shows the available water from the best flow test, the system automatic sprinkler demand and required fire pump and ground storage tank required capacities.

4.3 –SUSTAINMENT BRIGADE TEMF WITH PUMP AND NO GROUND STORAGE TANK

The next set of calculations is based on the Sustainment Brigade site for the TEMF which is the highest hazard of the buildings with fire booster pump. This calculation shows the available water from the best flow test, the system automatic sprinkler demand and required fire booster pump capacity.



APPENDIX A

FORT BLISS WATER SERVICE COMPANY

FLOW TEST REPORTS

**FLOW TEST REPORT**

LOCATION Bldg # 5800 Area
TEST MADE BY Jorge Zalce
REPRESENTATIVE OF F.B.W.S.C
WITNESS Juan Del La Riva
PURPOSE OF TEST Hydrant fire flow
IF PUMPS AFFECT TEST, Pumps were off
INDICATE PUMPS

DATE 9/11/2009
TIME 1400

FLOW HYDRANTS 5800-27
RESIDUAL HYDRANTS 5800-26

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
27 - 5800 Area	Muller	Y	Y	No Date	2.5	0.9	50	26	12	581	656
26 - 5800 Area	Muller	Y	Y	1958	2.5	0.9	50	26	15	650	733

* All Test were performed using dual hydrants

**FLOW TEST REPORT**

LOCATION Bldg # 5800 Area
TEST MADE BY Jorge Zalce
REPRESENTATIVE OF F.B.W.S.C
WITNESS Juan Del La Riva
PURPOSE OF TEST Hydrant fire flow
IF PUMPS AFFECT TEST, Pumps were off
INDICATE PUMPS

DATE 9/11/2009
TIME 1500

FLOW HYDRANTS 5800-36
RESIDUAL HYDRANTS 5800-35

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
36 - 5800 Area	Kennedy	N	N	2000	2.5	0.9	50	26	18	712	803
35 - 5800 Area	Muller	Y	Y	1958	2.5	0.9	52	31	20	750	942

* All Test were performed using dual hydrants

**FLOW TEST REPORT****LOCATION** Hydrant 5300-15 Near Elevated Tank 5301**TEST MADE BY** Juan Del La Riva**DATE** 10/20/2009**REPRESENTATIVE OF** F.B.W.S.C.**WITNESS** Cesar Garcia**PURPOSE OF TEST** hydrant fire flow**IF PUMPS AFFECT TEST,** Booster Pumps were off**INDICATE PUMPS****FLOW HYDRANTS** 5300-15**RESIDUAL HYDRANTS**

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
5300-15	Muller	Y	Y	1966	2.5	0.9	54	40	35	993	1603

**FLOW TEST REPORT**

LOCATION Bldg # 2900 Area (Carrington & Haan)
TEST MADE BY Jorge Zalce
REPRESENTATIVE OF F.B.W.S.C
WITNESS Juan Del La Riva
PURPOSE OF TEST Hydrant fire flow
IF PUMPS AFFECT TEST, Pumps were on
INDICATE PUMPS

DATE 9/16/2009
TIME 1:00

FLOW HYDRANTS 2900-6
RESIDUAL HYDRANTS 2900-7

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
6 - 2900 Area	Muller	N		1976	2.5	0.9	60	38	37	1021	1410
7 - 2900 Area	Muller	N		1976	2.5	0.9	60	40	37	1021	1484

* All Test were performed using dual hydrants

**FLOW TEST REPORT**

LOCATION #2900-10 Haan (between Carrington & Kramer)
TEST MADE BY Juan Del La Riva
REPRESENTATIVE OF F.B.W.S.C.
WITNESS Cesar Garcia
PURPOSE OF TEST hydrant fire flow
IF PUMPS AFFECT Booster Pumps were off
TEST, INDICATE PUMPS

FLOW HYDRANTS #2900-9
RESIDUAL HYDRANTS #2900-10

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
#2900-9	Muller	Y	Y	1976	2.5	0.9	64	54	50	1186	2641
#2900-10	Muller	Y	Y	2001	2.5	0.9	64	56	40	1061	2664

* All Test were performed using dual hydrants

**FLOW TEST REPORT**

LOCATION #2900-23 Stennis (between Carrington & Kramer)
TEST MADE BY Juan Del La Riva
REPRESENTATIVE OF F.B.W.S.C.
WITNESS Cesar Garcia
PURPOSE OF TEST hydrant fire flow
IF PUMPS AFFECT Booster Pumps were off
TEST, INDICATE PUMPS

FLOW HYDRANTS #2900-23**RESIDUAL HYDRANTS** #2900-22

HYDRANT NO.	MAKE	lead valve	working	YEAR	OUTLET NOZZLE (IN)	OUTLET NOZZLE COEFFICIENT	STATIC PRESSURE (PSI)	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	FLOW (GPM)	FLOW @ 20 PSI (GPM)
#2900-23	Muller	Y	Y	1997	2.5	0.9	50	40	30	919	1663
#2900-22	Muller	N	N	2001	2.5	0.9	50	40	35	993	1797

* All Test were performed using dual hydrants



APPENDIX B

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

HUITT - ZOLLARS, INC.

SHEET NO: 1	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL COF WITH NO PUMP

A. GENERAL INFORMATION (FLOW TEST DATA :FIRE HYDRANT 5300-15 ON 09-11-2009) :

STATIC PRESSURE :		PSI
RESIDUAL PRESSURE :		PSI
FLOW @ RESIDUAL PRESSURE		GPM
FLOW @ 20 PSI		GPM

B. DESIGN BASIS :

DESIGN IS BASED ON ORDINARY HAZARD GROUP 2 WITH A MINIMUM DENSITY
OF 0.2 GPM/SF OVER 3000 SF.

ROOF PITCH IS 1IN 6 OR LESS.

C. REQUIRED WATER FLOW :

AUTOMATIC SPRINKLER DEMAND :

0.2 GPM/SQ. FT. (DENSITY) X 3000 SQ. FT.
(DESIGN AREA) X 30 % (OVERAGE) = 780 GPM

HOSE STREAM DEMAND (EXTRA HAZARD GROUP 1) = 0 GPM

OTHER (IN RACK SPRINKLERS) 0 GPM

TOTAL WATER DEMAND = 780 GPM

D. REQUIRED WATER PRESSURE :

STANDPIPE - END HOSE PRESSURE = 0 PSI

AUTOMATIC SPRINKLER - MOST REMOTE HEAD PRESSURE :

0.2 GPM/SQ. FT. (DENSITY) X 130 SQ. FT.
(AREA/SPRINKLER) 8 K FACTOR SQUARED= 10.6 PSI

(K FACTOR = 5.6 FOR 0.50" SPRINKLER ORIFICE)

(K FACTOR = 8.0 FOR 0.75" SPRINKLER ORIFICE)

ELEVATION LOSS :

35 FT. (BLDG. HEIGHT) X 0.433 PSI/ FT. = 15.2 PSI

EXTERIOR PIPING FRICTION LOSS :

(UTILIZING 10" DISTRIBUTION AND 8" SUPPLY MAINS) 8 PSI

HUITT - ZOLLARS, INC.

SHEET NO: 2	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL COF WITH NO PUMP

INTERIOR PIPING FRICTION LOSS : (20 PSI MINIMUM) =	20	PSI
BACKFLOW PREVENTER FRICTION LOSS =	5	PSI
SAFETY FACTOR =	10	PSI
TOTAL REQUIRED WATER PRESSURE =	68.7	PSI

HUITT - ZOLLARS, INC.

SHEET NO: 1	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL DEPLOY STORAGE WITH NO PUMP

A. GENERAL INFORMATION:

STATIC PRESSURE :		PSI
RESIDUAL PRESSURE :		PSI
FLOW @ RESIDUAL PRESSURE		GPM
FLOW @ 20 PSI		GPM

B. DESIGN BASIS :

DESIGN IS BASED ON MISCELLANEOUS FLOOR STORAGE OF CLASS IV COMMODITIES STORED ON FLOOR 8 FEET HIGH OR LESS. DESIGN HAZARD IS BASED ON AN ORDINARY HAZARD DRY PIPE AUTOMATIC SPRINKLER SYSTEM WITH A DENSITY OF 0.2 GPM/SF OVER 3900 SF AS PER UFC 3-600, TABLE 4.1.

ROOF PITCH IS 1 IN 6 OR LESS.

C. REQUIRED WATER FLOW :

AUTOMATIC SPRINKLER DEMAND :			
0.2	GPM/SQ. FT. (DENSITY) X	3900	SQ. FT.
(DESIGN AREA) X	30	% (OVERAGE) =	1014 GPM
HOSE STREAM DEMAND (EXTRA HAZARD GROUP 1) =		0	GPM
OTHER (IN RACK SPRINKLERS)		0	GPM
TOTAL REQUIRED WATER DEMAND =		1014	GPM

D. REQUIRED WATER PRESSURE :

STANDPIPE - END HOSE PRESSURE =	0	PSI
---------------------------------	---	-----

AUTOMATIC SPRINKLER - MOST REMOTE HEAD PRESSURE :

0.2	GPM/SQ. FT. (DENSITY) X	130	SQ. FT.
(AREA/SPRINKLER)	8	K FACTOR SQUARED=	10.6 PSI

(K FACTOR = 5.6 FOR 0.50" SPRINKLER ORIFICE)

(K FACTOR = 8.0 FOR 0.75" SPRINKLER ORIFICE)

ELEVATION LOSS :

35	FT. (BLDG. HEIGHT) X	0.433	PSI/ FT. =	15.2	PSI
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EXTERIOR PIPING FRICTION LOSS :

(UTILIZING 10" DISTRIBUTION AND 8" SUPPLY MAINS)	8	PSI
--	---	-----

HUITT - ZOLLARS, INC.

SHEET NO: 2	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL DEPLOY STORAGE WITH NO PUMP

INTERIOR PIPING FRICTION LOSS : (20 PSI MINIMUM) =	20	PSI
BACKFLOW PREVENTER FRICTION LOSS =	5	PSI
SAFETY FACTOR =	10	PSI
TOTAL REQUIRED WATER PRESSURE =	68.7	PSI

HUITT - ZOLLARS, INC.

SHEET NO: 1	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL TEMF WITH NO PUMP

A. GENERAL INFORMATION (FLOW TEST DATA :FIRE HYDRANT 5800-35 ON 09-11-2009) :

STATIC PRESSURE :		PSI
RESIDUAL PRESSURE :		PSI
FLOW @ RESIDUAL PRESSURE		GPM
FLOW @ 20 PSI		GPM

B. DESIGN BASIS :

DESIGN IS BASED ON MISCELLANEOUS RACK STORAGE OF CLASS IV COMMODITIES STACKED ON OPEN RACKS 12 FEET OR LESS IN HEIGHT. MINIMUM DESIGN OF AUTOMATIC SPRINKLERS SHALL BE EXTRA HAZARD GROUP 1 OCCUPANCY (0.30 GPM/SF OVER 3000 SF) AS PER NFPA13-2007, TABLE 13.2.1.

ROOF PITCH IS 1IN 6 OR LESS.

C. REQUIRED WATER FLOW :

AUTOMATIC SPRINKLER DEMAND :			
0.3	GPM/SQ. FT. (DENSITY) X	3000	SQ. FT.
(DESIGN AREA) X	30	% (OVERAGE) =	1170 GPM
HOSE STREAM DEMAND (EXTRA HAZARD GROUP 1) =		0	GPM
OTHER (IN RACK SPRINKLERS)		0	GPM
TOTAL REQUIRED WATER DEMAND =		1170	GPM

D. REQUIRED WATER PRESSURE :

STANDPIPE - END HOSE PRESSURE =	0	PSI
---------------------------------	---	-----

AUTOMATIC SPRINKLER - MOST REMOTE HEAD PRESSURE :

0.3	GPM/SQ. FT. (DENSITY) X	100	SQ. FT.
(AREA/SPRINKLER)	8	K FACTOR SQUARED=	14.1 PSI

(K FACTOR = 5.6 FOR 0.50" SPRINKLER ORIFICE)

(K FACTOR = 8.0 FOR 0.75" SPRINKLER ORIFICE)

ELEVATION LOSS :

35	FT. (BLDG. HEIGHT) X 0.433 PSI/ FT. =	15.2	PSI
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EXTERIOR PIPING FRICTION LOSS :

(UTILIZING 10" DISTRIBUTION AND 8" SUPPLY MAINS)	8	PSI
--	---	-----

HUITT - ZOLLARS, INC.

SHEET NO: 2	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: TYPICAL TEMF WITH NO PUMP

INTERIOR PIPING FRICTION LOSS :		
(20 PSI MINIMUM) =	20	PSI
BACKFLOW PREVENTER FRICTION LOSS =	5	PSI
SAFETY FACTOR =	10	PSI
TOTAL REQUIRED WATER PRESSURE =	72.2	PSI

HUITT - ZOLLARS, INC.

SHEET NO: 1	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-484401.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	--------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: THAAD & JLENS TEMF WITH PUMP AND GROUND STORAGE WATER TANK

A. GENERAL INFORMATION (FLOW TEST DATA :FIRE HYDRANT 5800-26 ON 09-11-2009) :

STATIC PRESSURE :	50	PSI
RESIDUAL PRESSURE :	26	PSI
FLOW @ RESIDUAL PRESSURE	650	GPM
FLOW @ 20 PSI	733	GPM

B. DESIGN BASIS :

DESIGN IS BASED ON MISCELLANEOUS RACK STORAGE OF CLASS IV COMMODITIES STACKED ON OPEN RACKS 12 FEET OR LESS IN HEIGHT. MINIMUM DESIGN OF AUTOMATIC SPRINKLERS SHALL BE EXTRA HAZARD GROUP 1 OCCUPANCY (0.30 GPM/SF OVER 3000 SF) AS PER NFPA13-2007, TABLE 13.2.1.

ROOF PITCH IS 1IN 6 OR LESS.

C. REQUIRED WATER FLOW :

AUTOMATIC SPRINKLER DEMAND :

0.3	GPM/SQ. FT. (DENSITY) X	3000	SQ. FT.
(DESIGN AREA) X	30	% (OVERAGE) =	1170 GPM

HOSE STREAM DEMAND (EXTRA HAZARD GROUP 1) = 0 GPM

OTHER (IN RACK SPRINKLERS) 0 GPM

TOTAL WATER DEMAND = 1170 GPM

D. REQUIRED WATER PRESSURE :

STANDPIPE - END HOSE PRESSURE = 0 PSI

AUTOMATIC SPRINKLER - MOST REMOTE HEAD PRESSURE :

0.3	GPM/SQ. FT. (DENSITY) X	100	SQ. FT.
(AREA/SPRINKLER)	8	K FACTOR SQUARED=	14.1 PSI

(K FACTOR = 5.6 FOR 0.50" SPRINKLER ORIFICE)

(K FACTOR = 8.0 FOR 0.75" SPRINKLER ORIFICE)

ELEVATION LOSS :

35	FT. (BLDG. HEIGHT) X	0.433	PSI/ FT. =	15.2	PSI
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EXTERIOR PIPING FRICTION LOSS : (BASED ON 1170 GPM SPRK.)

10	MAIN SIZE (IN.) :	2500	LF X
0.0032	PSI/LF =	8.0	PSI

HUITT - ZOLLARS, INC.

SHEET NO: 2	OF: 2
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
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REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: THAAD & JLENS TEMF WITH PUMP AND GROUND STORAGE WATER TANK

EXTERIOR PIPING FRICTION LOSS : (BASED ON 1170 GPM SPRK.)

8	MAIN SIZE (IN.) :	1000	LF X		
0.0093	PSI/LF =			9.3	PSI

INTERIOR PIPING FRICTION LOSS :
(20 PSI MINIMUM) =

20 PSI

BACKFLOW PREVENTER FRICTION LOSS =

0 PSI

SAFETY FACTOR =

10 PSI

TOTAL REQUIRED WATER PRESSURE =

76.5 PSI

E. PRESSURE SUMMARY :

TOTAL REQUIRED WATER PRESSURE = 76.5

AVAILABLE RESIDUAL PRESSURE (SEE GRAPH) = 0.0

EXCESS PRESSURE = 0.0

REQUIRED PUMP BOOST = 100.0

F. BOOSTER PUMP SELECTION :

TYPE : HORIZONTAL SPLIT CASE - DIESEL

MANUFACTURER AND MODEL : FAIRBANKS MORSE #6-1824BF

SUCTION SIZE (IN) : 8 DISCHARGE SIZE(IN): 6

1250	GPM @	100	PSI	
175	HP	1750	RPM @	120 VAC - 1 PH

G. GROUND STORAGE RESERVOIR CAPACITY:

1170 GPM TOTAL WATER DEMAND X

120 MINUTES = 140400 GALS.

H. GROUND STORAGE RESERVOIR SELECTION:

HEIGHT : 20 FT. DIAMETER : 34 FT.

NOMINAL CAPACITY 150,000 GALS.

HUITT - ZOLLARS, INC.

SHEET NO: 1	OF: 3
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
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REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: SUSTAINMENT BRIGADE TEMF WITH PUMP AND NO GROUND STORAGE WATER TANK

A. GENERAL INFORMATION (FLOW TEST DATA :FIRE HYDRANT 5300-15 ON 09-11-2009) :

STATIC PRESSURE :	64	PSI
RESIDUAL PRESSURE :	56	PSI
FLOW @ RESIDUAL PRESSURE	1061	GPM
FLOW @ 20 PSI	2664	GPM

B. DESIGN BASIS :

DESIGN IS BASED ON MISCELLANEOUS RACK STORAGE OF CLASS IV COMMODITIES STACKED ON OPEN RACKS 12 FEET OR LESS IN HEIGHT. MINIMUM DESIGN OF AUTOMATIC SPRINKLERS SHALL BE EXTRA HAZARD GROUP 1 OCCUPANCY (0.30 GPM/SF OVER 3000 SF) AS PER NFPA13-2007, TABLE 13.2.1.

ROOF PITCH IS 1IN 6 OR LESS.

C. REQUIRED WATER FLOW :

AUTOMATIC SPRINKLER DEMAND :

0.3	GPM/SQ. FT. (DENSITY) X	3000	SQ. FT.	
(DESIGN AREA)	X	30	% (OVERAGE) =	1170 GPM

HOSE STREAM DEMAND (EXTRA HAZARD GROUP 1) = 0 GPM

OTHER (IN RACK SPRINKLERS) 0 GPM

TOTAL WATER DEMAND = 1170 GPM

D. REQUIRED WATER PRESSURE :

STANDPIPE - END HOSE PRESSURE = 0 PSI

AUTOMATIC SPRINKLER - MOST REMOTE HEAD PRESSURE :

0.3	GPM/SQ. FT. (DENSITY) X	100	SQ. FT.	
(AREA/SPRINKLER)	8	K FACTOR SQUARED=	14.1	PSI

(K FACTOR = 5.6 FOR 0.50" SPRINKLER ORIFICE)

(K FACTOR = 8.0 FOR 0.75" SPRINKLER ORIFICE)

ELEVATION LOSS :

30	FT. (BLDG. HEIGHT) X	0.433	PSI/ FT. =	13.0	PSI
----	----------------------	-------	------------	------	-----

EXTERIOR PIPING FRICTION LOSS : (BASED ON 1170 GPM SPRK.)

10	MAIN SIZE (IN.) :	2900	LF X	
0.0032	PSI/LF =	9.3	PSI	

HUITT - ZOLLARS, INC.

SHEET NO: 2	OF: 3
DESIGN: TSB	CHECKED: SEP

DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
------------------	------------------------	--

REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: SUSTAINMENT BRIGADE TEMF WITH PUMP AND NO GROUND STORAGE WATER TANK

EXTERIOR PIPING FRICTION LOSS : (BASED ON 1170 GPM SPRK.)

8	MAIN SIZE (IN.) :	1800	LF X	
0.0093	PSI/LF =		16.7	PSI

 INTERIOR PIPING FRICTION LOSS :
 (20 PSI MINIMUM) =

20 PSI

BACKFLOW PREVENTER FRICTION LOSS =

5 PSI

SAFETY FACTOR =

10 PSI

TOTAL REQUIRED WATER PRESSURE =

88.1 PSI

E. PRESSURE SUMMARY :

TOTAL REQUIRED WATER PRESSURE =

88.1

AVAILABLE RESIDUAL PRESSURE (SEE GRAPH) =

54.4

EXCESS PRESSURE =

-33.7

REQUIRED PUMP BOOST =

55.0

F. BOOSTER PUMP SELECTION :

TYPE : HORIZONTAL SPLIT CASE - DIESEL

MANUFACTURER AND MODEL : FAIRBANKS MORSE #6-1823CF

SUCTION SIZE (IN) : 8 DISCHARGE SIZE(IN): 6

1250	GPM @	55	PSI
73	HP	1750	RPM @

120 VAC - 1 PH

4000 FEET ELEVATION

120 DEGREES F AMBIENT TEMPERATURE

G. GROUND STORAGE RESERVOIR CAPACITY: **NA**

1170 GPM TOTAL WATER DEMAND X

MINUTES = 0 GALS.

H. GROUND STORAGE RESERVOIR SELECTION: **NA**

HEIGHT : FT. DIAMETER : FT.

NOMINAL CAPACITY: GALS.

HUITT - ZOLLARS, INC.

SHEET NO: 3	OF: 3
DESIGN: TSB	CHECKED: SEP

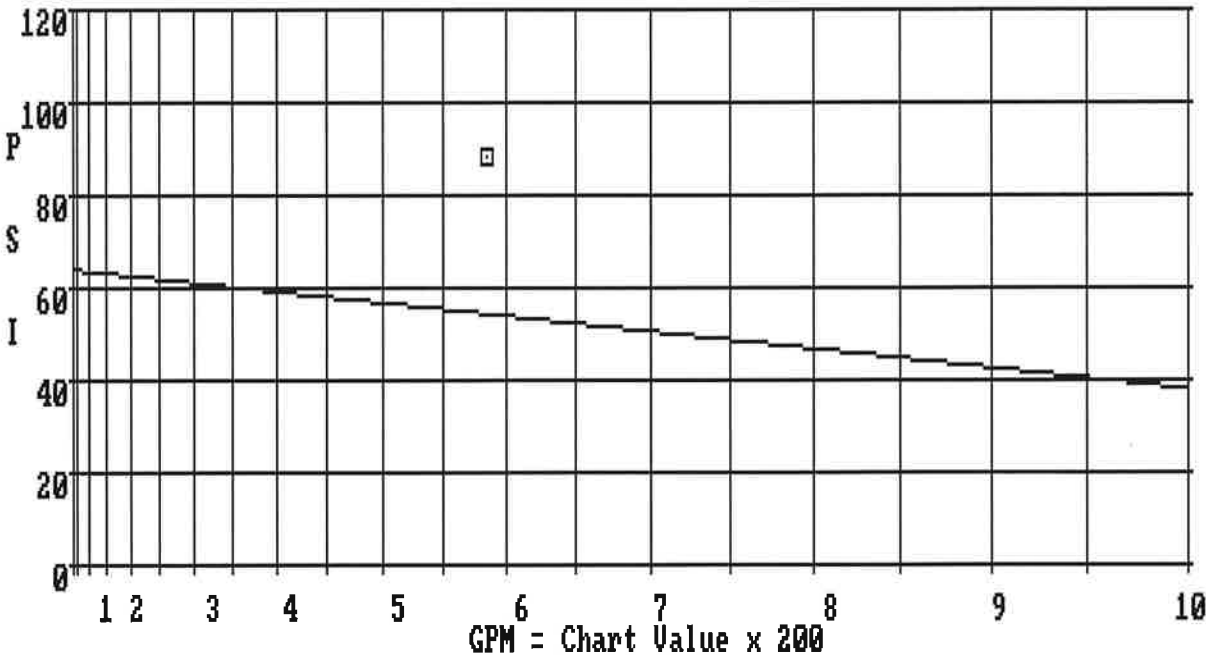
DATE: 11-12-2009	PROJECT NO: 01-4844.01	PROJECT: FT BLISS THAAD, JLENS AND SUSTAINMENT BRIGADE
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REVISED DATE:

FIRE PROTECTION AUTOMATIC SPRINKLER CALCULATIONS

BUILDING: SUSTAINMENT BRIGADE TEMF WITH PUMP AND NO GROUND STORAGE WATER TANK

HYDRAULICS SUPPLY/DEMAND GRAPH



ADJUSTED HYDRANT DATA: 1061 GPM, 64 STATIC PSI, 56 RESIDUAL PSI
DEMAND POINT DATA: 1170 GPM, 88.09 GAUGE PSI, -33.69 EXCESS PSI



APPENDIX C

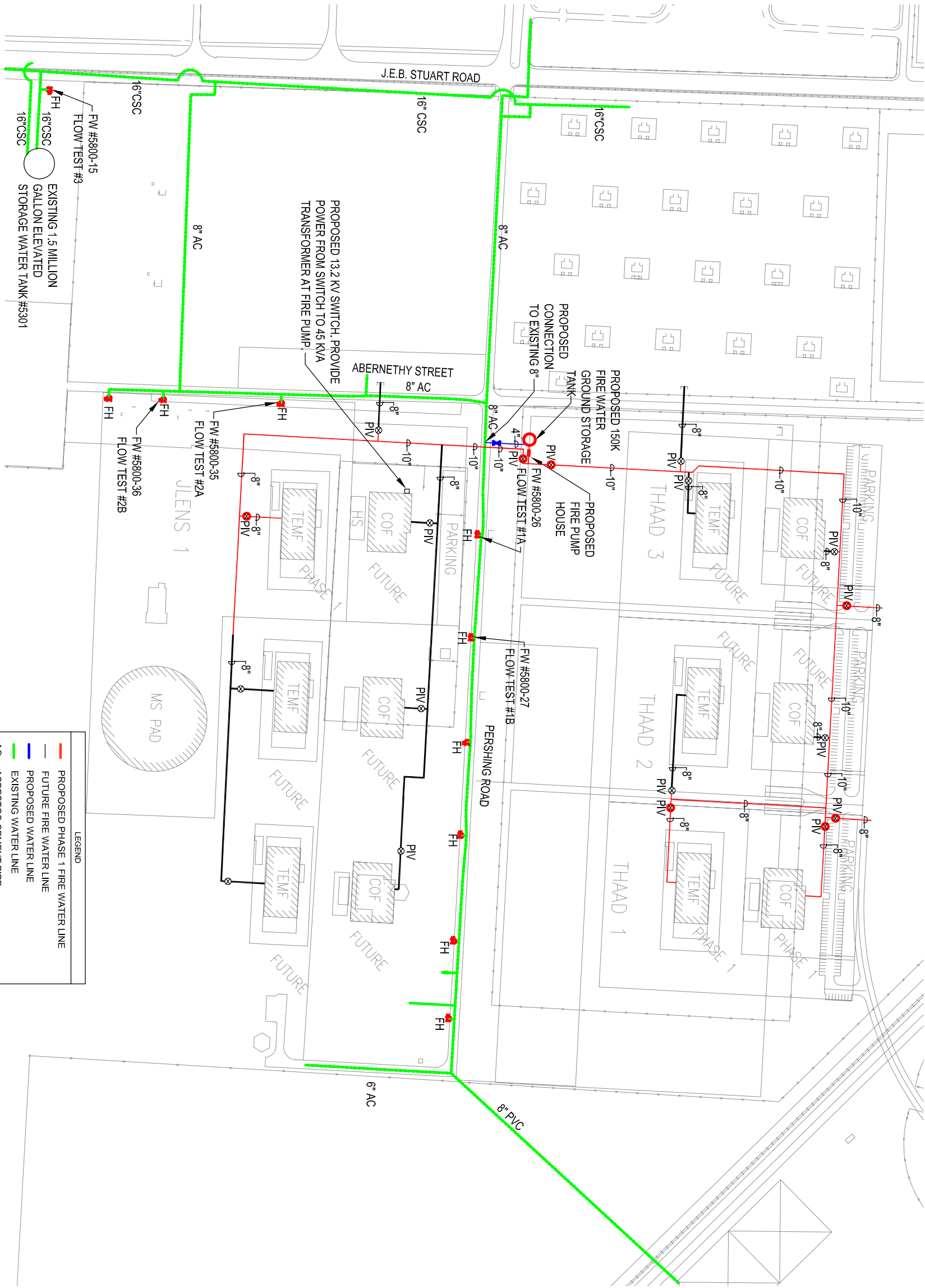
SCHEMATIC DRAWINGS



THAAD, JLENS AND SUSTAINMENT BRIGADE FIRE SYSTEM STUDY EXHIBIT

THAAD AND JLENS SITE

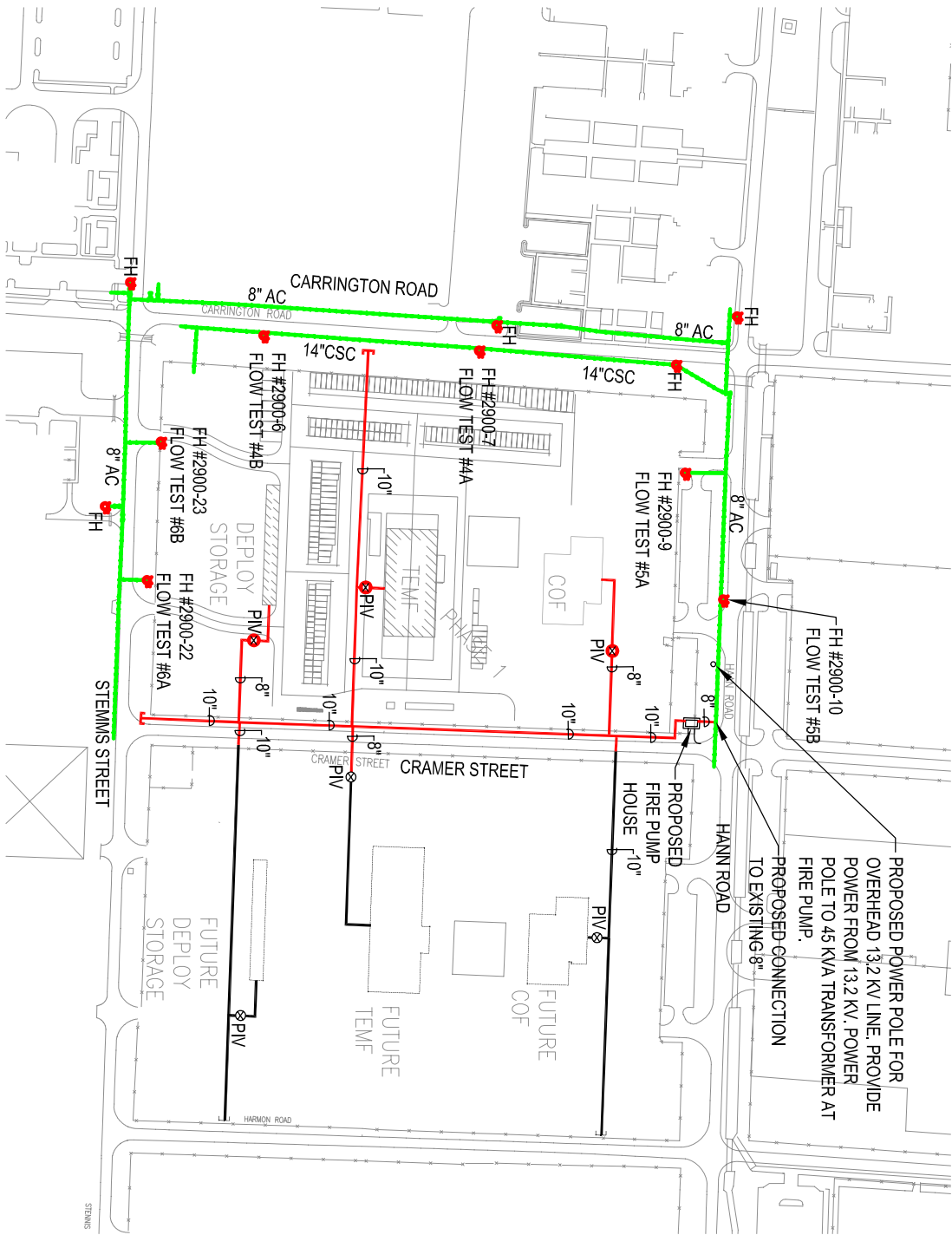
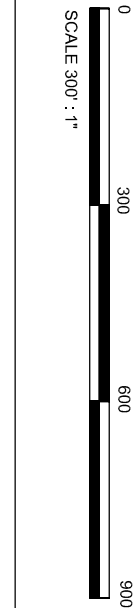
LEGEND	
—	PROPOSED PHASE 1 FIRE WATER LINE
—	FUTURE FIRE WATER LINE
—	PROPOSED WATER LINE
—	EXISTING WATER LINE
—	AC ASBESTOS CEMENT PIPE
—	CSC CONCRETE STEEL CYLINDER PIPE
—	FH EXISTING FIRE HYDRANT
⊗	PROPOSED PHASE 1 POST INDICATOR VALVE
⊗	FUTURE POST INDICATOR VALVE
⊗	VALVE IN BOX



DATE:	11-12-09
DRAWN:	LDM
DESIGNED:	TSB
CHECKED:	TSB
PROJ. NO.	01-4844-01
SHEET:	FT-1



JACOBS/HUNT-ZOLLARS
6668 North Central Expressway
Suite 400, MB13
Dallas, Texas 75206



LEGEND	
—	PROPOSED PHASE 1 FIRE WATER LINE
—	FUTURE FIRE WATER LINE
—	PROPOSED WATER LINE
—	EXISTING WATER LINE
—	ASBESTOS CEMENT PIPE
—	CONCRETE STEEL CYLINDER PIPE
●	EXISTING FIRE HYDRANT
⊗	PROPOSED PHASE 1 POST INDICATOR VALVE
⊗	FUTURE POST INDICATOR VALVE



THAAD, JLENS AND SUSTAINMENT BRIGADE FIRE SYSTEM STUDY EXHIBIT

SUSTAINMENT SITE



JACOBS/HUNT-ZOLLARS
6688 North Central Expressway
Suite 400, MB13
Dallas, Texas 75206

DATE:	11-12-09
DRAWN:	LDM
DESIGNED:	TSB
CHECKED:	TSB
PROJ. NO.	01-4844-01
SHEET:	FT-2

APPENDIX E

ENVIRONMENTAL INFORMATION

APPENDIX E
ENVIRONMENTAL DOCUMENTS
TABLE OF CONTENTS

- Potable Regulatory Policy (Policy Letter #16)
- Cross Connection Control Manual for Fort Bliss

Potable Regulatory Policy (Policy Letter #16)

REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY GARRISON COMMAND
BUILDING 1 PERSHING ROAD
FORT BLISS, TEXAS 79916-6812

IMSW-BLS-ZA

1 April 2006

POLICY LETTER #16

SUBJECT: Potable Water Regulatory Policy: Plumbing Customer Service Inspections (CSI) and Backflow Prevention Assembly Test Forms

1. **PURPOSE:** The Fort Bliss Water Services Company (FBWS) operates 9 water systems on Post: Fort Bliss Main Post, Biggs Army Air Field, Site Monitor, McGregor/Meyer Range Camp, Dona Ana Range Camp, Oro Grande Range Camp, Hueco Range Camp, SHORAD, and Redeye. FBWS is responsible for protecting the drinking water supply in accordance with State Regulations (Title 30 Texas Administrative Code 290.46(j), New Mexico Administrative Code 20.7.10.400(L)) from contamination or pollution which could result from improper water system plumbing construction or configuration.

2. Effective immediately, Customer Service Inspection certificates shall be completed prior to providing continuous water service to new construction or after significant plumbing renovations on any existing service or any existing service when the FBWS has reason to believe that cross-connections or other potential contaminant hazard exist or after any material improvement, correction, or addition to the water distribution facilities. As unacceptable plumbing practices are discovered, they shall be promptly eliminated to prevent possible contamination of the water supply. Also, any backflow prevention devices installed shall be installed in accordance with the Fort Bliss Cross-Connection Control Manual (FBCCCM), and tested in accordance with the FBCCCM.

3. **RESTRICTIONS:** The following unacceptable practices are prohibited:

a. No direct connection between the public drinking water supply and a potential source of contamination is permitted. Potential sources of contamination shall be isolated from the public water supply in accordance with the FBCCCM.

b. No cross-connection between the public water supply and a private water system is permitted. These potential threats to the public drinking water supply shall be eliminated at the service connection by the installation of an air-gap or a reduced pressure-zone backflow prevention device.

c. No connection which allows water to be returned to the public drinking water supply is permitted.

POLICY LETTER #16

SUBJECT: Potable Water Service Agreement: Plumbing Customer Service Inspections (CSI) and Backflow Test Forms

- d. No pipe or pipe fitting which contains more than 8.0% lead may be used for the installation or repair of plumbing at any connection which provides water for human use.
- e. No solder or flux which contains more than 0.2% lead can be used for the installation or repair of plumbing at any connection which provides water for human use.
- 3. This policy applies to work completed on all Fort Bliss facilities whether work is done by contract or in-house. Activities must insure that their contractors/ subcontractors follow this requirement.
- 4. Inspectors must possess proper credentials and be recognized as capable of conducting a customer service inspection certification by the State of Texas. Customer Service inspections may be performed by the following group members:
 - a. Plumbing Inspectors and Water Supply Protection Specialists licensed by the Texas State Board of Plumbing Examiners.
 - b. Customer Service Inspectors licensed by the Texas Commission of Environmental Compliance (TCEQ).
- 5. Recognized Backflow assembly testers must possess a current license from the TCEQ.
- 6. Submit completed customer service inspection and/or backflow test forms to the Directorate of Environment (DOE), IMSW-BLS-Z, Bldg 622, Attn: Water Program Manager, Fort Bliss, Texas 79916, or in person at bldg 622 room 111, or by fax at 568-1333. Copies of the FBCCCM are available from the DOE Water Program Manager, office phone number 568-6364. Forms will be maintained by the Directorate of Environment for a minimum of 10 years and be made readily available for review by the State regulatory entity.

- 2 Enclosures
- 1. CSI Certificate
- 2. Backflow Assembly Test Report

ROBERT T. BURNS
COL, AD
Commanding

FORT BLISS CUSTOMER SERVICE INSPECTION CERTIFICATE

Name of PWS: _____ PWS I.D.# _____

Bldg No. or Facility Description: _____

Contract # or Work Order #: _____

Contract issued by: _____ Prime Contractor: _____

Reason for Inspection:

New construction ☐Existing service where contaminant hazards are suspected ☐Major renovation or expansion of distribution facilities ☐

I _____, upon inspection of the private water distribution facilities connected to the aforementioned public water supply (PWS) do hereby certify that, to the best of my knowledge:

Compliance Non-compliance

☐ ☐

1. No direct connection between the public drinking water supply and a potential source of contamination exists. Potential sources of contamination are isolated from the public water system by an air gap or an appropriate backflow prevention assembly in accordance with Commission regulations.

☐ ☐

2. No cross-connection between the public drinking water supply and a private water system exists. Where an actual air gap is not maintained between the public water supply and a private water supply, an approved reduced pressure-zone backflow prevention assembly is properly installed and a service agreement exists for annual inspection and testing by a certified backflow prevention assembly tester.

☐ ☐

3. No connection exists which would allow the return of water used for condensing, cooling or industrial processes back to the public water supply.

☐ ☐

4. No pipe or pipe fitting which contains more than 8.0% lead exists in private water distribution facilities installed on or after July 1, 1988.

☐ ☐

5. No solder or flux which contains more than 0.2% lead exists in private water distribution facilities installed on or after July 1, 1988.

I further certify that the following materials were used in the installation of the private water distribution facilities:

Service lines Lead ☐ Copper ☐ PVC ☐ Other ☐Solder Lead ☐ Lead Free ☐ Solvent Weld ☐ Other ☐

Copy of inspector's certification card submitted to DOE. ☐ yes ☐ no (If no, please attach copy of inspector's certification card.)

I recognize that this document shall become a permanent record of the aforementioned Public Water System and that I am legally responsible for the validity of the information I have provided.

Remarks: _____

Signature of Inspector_____
Registration Number_____
Title_____
Type of Registration_____
Date

Fort Bliss

Backflow Prevention Assembly Test Report

ATZC-DOE, Building 622, Fort Bliss, TX 79916

Phone: (915) 568-1041

Fax: (915) 568-1333

General Information

Area / Range Camp _____ **Building Name** _____

Building Number _____ **Building Location** _____

Point of Contact _____ **Phone** _____

Current Assembly Information

Manufacturer _____ **Model** _____

Serial No. _____ **Size** _____ **Tag** _____

Type of service: ☐ Containment/Domestic
☐ Containment/Fire System
☐ Containment/Lawn Irr.
☐ Isolation

Specific physical location of assembly:

Equipment or system isolated:

Removed Assembly Information

Manufacturer

Model

Size

Serial No.

Gauge Information

ID

Manufacturer

Model

Serial No.

Last date of calibration

Test Results

Status ☒ Pass ☐ Fail

Additional Requirements

☐ Yes ☐ N/A

Thermal Expansion Control Present? ☐ No ☐ Unknown

(Containment domestic only)

Requirements made known? ☐ Yes ☐ No ☐ N/A

Adequate Freeze Protection Present? ☐ Yes ☐ No ☐ N/A

Requirements made known? ☐ Yes ☐ No ☐ N/A

Comments or Repairs made:

Test Type ☐ Initial ☐ Annual ☐ Repair ☐ Relocate

RP

CV1 AR _____

RV _____

CV2 Tight? ☐ Yes ☐ No

CV1 CR _____

CV2 _____

Buffer _____

DC CV1 _____ CV2 _____	
PVB _____ AIV _____ CV	SVB _____ _____

***The backflow prevention assembly detailed on this report has been tested and maintained as required and is certified to be operating within acceptable parameters.
I also certify that I tested this assembly and the test results are true.***

Technician ID	Name	Phone
---------------	------	-------

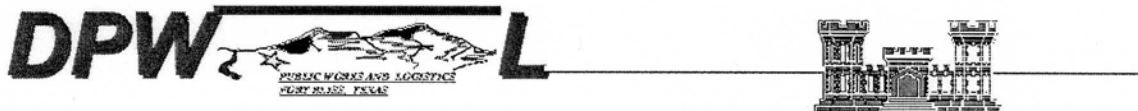
Signature _____ Time of Test _____ Date _____

Firm	Address	City	State	Zip
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
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Cross Connection Control Manual for Fort Bliss

United States Army Air
Defense Artillery Center
Fort Bliss, Texas

**Cross-Connection Control
Manual**



Cross-Connection Control Manual

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ACRONYMS and ABBREVIATIONS

AG	Air Gap
ANSI	American National Standards Institute
ASSE	American Society of Sanitary Engineers
AVB	Atmospheric Vacuum Breaker
DC	Double Creek Valve Assembly
FCCCHR	Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California
NMED	New Mexico Environment Department
PVB	Pressure Vacuum Breaker
RP	Reduced Pressure Principle Assembly
SVB	Spill-Resistant Pressure Vacuum Breaker
TCEQ	Texas Commission on Environmental Quality
UPC	Uniform Plumbing Code

Cross-Connection Control Manual**INTRODUCTION**

Congress passed the 1974 Safe Drinking Water Act (SDWA), Public Law 93-523, to protect public drinking water supplies from harmful contaminants. Because Ft. Bliss is located in New Mexico and Texas, the Texas Commission on Environmental Quality (TCEQ) and the New Mexico Environment Department (NMED) are responsible for implementing the standards of the SDWA within their respective states. The primary function of Ft. Bliss as a water purveyor is to provide safe drinking water. As a result, they may incur liability for the quality of water provided. The TCEQ and the NMED prohibit connections to the public water supply where a contamination hazard exists, unless the public water supply is protected by approved backflow prevention methods, devices, or assemblies.

Ft. Bliss has established and will provide for a Cross-Connection Control Program pursuant to Title 30, Texas Administrative Code, Chapter 290, Public Drinking Water; the Texas Health and Safety Code, Chapter 341, Minimum Standards of Sanitation and Health Protection Measures; and the New Mexico Environment Department, Title 20 Environmental Protection, Chapter 7, Wastewater and Water Supply Facilities. This Program safeguards the Ft. Bliss water distribution system from contamination by containing hazards at the service connection and/or within premises served by the Ft. Bliss water distribution system and by the installation, testing, and maintenance of backflow prevention methods, devices, or assemblies.

This manual is intended to augment the Ft. Bliss Cross-Connection Control Program and to serve as the minimum standard for implementing the Program. The manual adheres to the standards in the latest editions of The Manual for Cross-Connection Control by the Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR) at the University of Southern California and the Uniform Plumbing Code (UPC). Included in the manual are technical specifications and standards to define proper backflow prevention assembly applications, installation details and criteria, test procedures, care of test equipment, and test report forms. The manual assigns or clarifies responsibilities of the Cross-Connection Control Program Manager, the backflow prevention technician, and private sector contractors.

Because Ft. Bliss must comply with the regulations of New Mexico and Texas, the provisions of this manual are applicable to both states. Wherever a provision of a state occurs that does not apply to the other state, the provision shall be noted as such.

No manual can remain current indefinitely. All holders of this manual should anticipate additions, deletions, and amendments. The Ft. Bliss Cross-Connection Control Program Manager will make available subsequent changes.

Approved Backflow Prevention Assembly

An assembly that has been manufactured in full compliance with the American Water Works Association standards C510 and C511 and appears on the most current List of Approved Backflow Prevention Assemblies, published by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.

Auxiliary Water System

Any water supply on or available to the premises other than the Ft. Bliss water distribution system. These auxiliary waters are not under the sanitary control of Ft. Bliss and may include water from another public water supplier, wells, used or reclaimed water, or industrial fluids.

Backflow

The unintended or undesirable reversal of the normal water flow caused by either backsiphonage or backpressure.

Backflow Prevention Methods, Devices, and Assemblies

The types of backflow prevention methods, devices, and assemblies shall be based on the existing or potential degree of hazard, and backflow condition. The definitions for each type of backflow prevention method, device, or assembly listed below are contained in subsequent sections of this manual. The types are as follows:

Air gap	Method
Atmospheric vacuum breaker	Device
Double check valve	Assembly
Pressure vacuum breaker	Assembly
Reduced pressure principle	Assembly
Spill-resistant pressure vacuum breaker	Assembly

The definitions for each type of backflow prevention method, device, or assembly listed above are contained in subsequent sections of this manual

Backflow Prevention Technician

A person deemed knowledgeable and competent in the installation, testing, maintenance, and repair of backflow prevention assemblies as determined by successful completion of a training course approved by the Cross-Connection Control Program Manager.

Cross-Connection Control Manual**DEFINITIONS****Backpressure**

A form of backflow due to an increase of system pressure that is greater than supply pressure.

Backsiphonage

A form of backflow due to negative or decreased pressure in the water supply system.

Containment Cross-Connection Control

Provides protection of the water distribution system from the backflow of contaminants. This is accomplished by the installation of an air gap or an approved backflow prevention assembly at the water service connection. Containment cross-connection control does not provide protection to the occupants of the premises, but shall be considered as additional backflow protection and shall not negate the use of backflow prevention on internal hazards within a premises potable water system.

Contamination

The presence of any foreign substance (organic, inorganic, radiological, or biological) in water that tends to degrade its quality to constitute a health hazard or impair the usefulness of the potable water system.

Continuous Pressure

A point in the potable water system that may be subjected to operating pressure for more than twelve hours in a twenty-four hour period.

Cross Connection

A point in the potable water system that is connected directly, or has the potential of being connected, to a source of non-potable substance through which contaminants may enter the potable water system under any condition.

Cross Connection — Controlled

A cross connection with an approved backflow prevention method, device, or assembly properly installed and maintained so that it will continuously afford protection commensurate with the degree of hazard.

Cross-Connection Control Program Manager

The person designated to administer the Cross-Connection Control Program and who is currently recognized as a backflow prevention assembly technician.

Ft. Bliss

A publicly owned water and sewer agency located in and serving the people of Ft. Bliss.

Cross-Connection Control Manual**DEFINITIONS****Health Hazard**

An actual or potential threat of contamination if introduced into the potable water system that may cause death, injury, illness or spread of disease.

Isolation Cross-Connection Control

Provides protection to the occupants of a premises by the installation of approved backflow prevention methods, devices, or assemblies at each cross connection within the premises' potable water system.

Non-Health Hazard

An actual or potential threat of pollution if introduced into the potable water system that would constitute a nuisance, inconvenience, or be aesthetically objectionable.

Pollution

The presence of any foreign substance in the potable water system that tends to degrade its quality but not constitute a health hazard or impair the usefulness of the water.

Premises Potable Water System

Those parts of the premises or other areas beyond the water service connections that are utilized in conveying potable water to points of use.

System Hazard

An actual or imminent threat of contamination to the water distribution system presenting a danger to public health.

Water Distribution System

The network of conduits used for the delivery of potable water from the source to the water service connection.

Water Service Connection

The point of connection to the water distribution system carrying potable water to the building, other points of use, or distribution on the property.

Cross-Connection Control Manual**RESPONSIBILITIES****Cross-Connection Control Program Manager**

The Directorate of the Environment is responsible for the sanitary control of the Ft. Bliss water distribution system and the premises potable water system.

A member of the Directorate of the Environment shall be designated as the Cross-Connection Control Program Manager. The manager is responsible for all administrative duties and for maintaining an aggressive cross-connection control program within the Ft. Bliss water distribution system and all premises potable water systems.

The manager's responsibilities include but are not limited to:

1. Administration and enforcement of all the provisions of the cross-connection control program.
2. The prevention of contaminants from entering a premises potable water system by the use of backflow prevention methods, devices, and assemblies installed at each cross connection within the premises potable water system.
3. The prevention of contaminants originating within a premises potable water system from entering the Ft. Bliss water distribution system by the use of backflow prevention methods and assemblies installed at each water service connection.
4. The prevention of contaminants from entering the City of El Paso's water distribution system from the Ft. Bliss water distribution system by the use of backflow prevention methods and assemblies installed at each water service connection to Ft. Bliss.
5. The completion of a detailed cross-connection control survey of the entire water distribution system and all premises potable water systems every five years.
6. Affirm that all testing performed at Ft. Bliss meets the requirements of this manual. This is accomplished by reviewing test reports. The Cross-Connection Control Program Manager also may select a percentage of tests to witness or confirm by testing after the technician.
7. Ensure that all certified backflow prevention technicians are properly certified in New Mexico and Texas.
8. Review plumbing plans and inspect plumbing systems as they are installed for compliance with the cross-connection control program.
9. Inspect installations of backflow prevention methods, devices, and assemblies for compliance with this manual installed by Ft. Bliss personnel or by private sector contractors.
10. Require unacceptable plumbing practices to be promptly eliminated to prevent actual or potential contamination of the potable water system.

Cross-Connection Control Manual**RESPONSIBILITIES**

11. Establish an annual schedule of inspecting and testing all backflow prevention methods, devices, and assemblies.
12. Keep accurate records of installations, tests, inspections, and repairs made to backflow prevention assemblies for a minimum period of three years.

Backflow Prevention Technician

The Backflow Prevention Technician is responsible for safeguarding the Ft. Bliss water distribution system and all premises potable water systems. The technician's responsibilities include but is not limited to:

1. Register with the Cross-Connection Control Program Manager prior to testing backflow prevention assemblies within the jurisdiction of the Cross-Connection Control Program Manager. Each technician shall be issued an identification number that must appear on all backflow prevention assembly test report forms.
2. Submit reports of assembly testing and repairs to the Cross-Connection Control Program Manager within one week from the time the test was conducted. Testing of backflow prevention assemblies shall not be considered complete unless a satisfactory test report has been received by the Cross-Connection Control Program Manager
3. Inform the Cross-Connection Control Program Manager if any existing backflow prevention assembly is not installed commensurate with the degree of hazard, pressure conditions, or if the assembly is not installed in its required orientation.
4. Shall not alter the design or operation of backflow prevention methods, devices, and assemblies.
5. Maintain training requirements in New Mexico and Texas. New Mexico follows the FCCCHR policy whereby training requirements are renewed every three years. The TCEQ tester recognition is indefinite and does not require renewal. In order for technicians to be able test assemblies throughout Ft. Bliss, their training shall be renewed every three years.

Ft. Bliss Personnel and Private Sector Contractors

1. Ft. Bliss personnel and private sector contractors shall fully comply with the Ft. Bliss Cross-Connection Control Program. They are responsible for installing backflow prevention methods, devices, and assemblies in their required orientation, and in accordance with the proper degree of hazard and pressure condition as indicated in this manual.
2. Ft. Bliss personnel and private sector contractors shall notify the Cross-Connection Control Program Manager that backflow prevention methods, devices, and assemblies have been properly installed and are ready for inspection and testing. They shall be responsible for all parts and labor needed to prepare the assembly for its acceptance test.

Cross-Connection Control Manual

RESPONSIBILITIES

3. Newly installed assemblies shall not be placed into service until an acceptance test has been performed indicating satisfactory results.

Cross-Connection Control Manual**INFORMATION MANAGEMENT**

The Cross-Connection Control Program Manager shall utilize an information management system consisting of two databases — Survey and Testing.

Survey Database

1. The Cross-Connection Control Program Manager shall complete a detailed cross-connection control survey of the entire water distribution system and all premises potable water systems every five years. This will be accomplished by surveying twenty percent of all premises every year.
2. The survey shall be performed by experienced cross-connection control inspectors and shall include inspection of all exposed and visibly accessible potable water piping, water consuming equipment, lawn irrigation systems, and fire protection systems.
3. Cross-connection control inspectors shall use a survey form similar to the one shown on page 10.
4. The survey findings shall be documented into a cross-connection control Survey Information Management Database. The survey database shall produce reports that will include the location and identification of water uses, adequacy of existing protection, and corrective actions. The report will include the size and type of backflow prevention methods, devices, or assemblies needed, and a prioritized list of findings.

The survey database also shall produce water conservation reports listing the location and identification of all applicable plumbing fixtures and flow rates.

5. All of the items in the survey that require corrective action are considered a health hazard and shall be corrected as soon as possible. The following prioritized list shall be followed in planning corrective actions:

Priority 1 —Contamination imminent

Where conditions or activities exist in which the introduction of a contaminant to the premises potable water system or the water distribution system is imminent.

Priority 2 — Contamination potential

Where conditions or activities exist in which there is a potential for the introduction of a contaminant to the premises potable water system or the water distribution system.

Priority 3 — No action required

Where cross connections are under control by the presence of an approved backflow prevention method, device, or assembly and there is no imminent or potential threat of contamination to the premises potable water system or the water distribution system.

Cross-Connection Control Manual**INFORMATION MANAGEMENT****Priority 4 — Installation correction**

Where cross connections are under control by the presence of an approved backflow prevention method, device, or assembly; however, the installation may not be installed in full compliance with the UPC or FCCCHR and shall require corrective action.

Priority 5 — Piping system note

Where a portion of the piping system does not present a threat of contamination to the premises potable water system or the water distribution system but may be a concern such as piping leaks or safety hazards.

6. The survey shall include inspection of plumbing fixtures for water conservation compliance. The maximum water consumption flow rates and quantities for plumbing fixtures shall be in accordance with TCEQ, rule 290.252 and UPC, section 402.0. The following table describes the fixtures and maximum flow rates:

Maximum Flow Rates and Consumption for Plumbing Fixtures	
Plumbing Fixture	Maximum Flow Rate or Quantity
Water closet	1.6 gallons per flush
Urinal	1.0 gallons per flush
Shower head	2.5 gallons per minute
Sink, lavatory faucet, faucet aerator	2.2 gallons per minute
Faucet serving transient public	0.25 gallons per use & self-closing valve
Drinking fountain	Operated by self-closing valve
Emergency shower/eye wash	None

INFORMATION MANAGEMENT

Friday, February 19, 2010

Cross-Connection Control Manual**I****INFORMATION MANAGEMENT****Testing Database**

1. The Cross-Connection Control Program Manager is responsible for all backflow prevention assembly testing within the jurisdiction of the Directorate of the Environment.
2. All backflow prevention assemblies shall be tested for proper operation by backflow prevention technicians registered with the Cross-Connection Control Program Manager.
3. Backflow prevention technicians shall use the test report form shown on page 17. The form may be recreated from the testing database
4. All backflow prevention assembly test reports — pass or fail — shall be entered into the Testing Information Management Database. The testing database shall produce individual and summary reports. The reports shall include relevant information such as area, building, assembly, test findings, repairs, thermal expansion measures, adequacy of freeze protection, test equipment used, and technician identification.
5. The testing database shall incorporate automated defaults for ensuring proper testing information. Test reports shall default to "Fail" until proper test findings are entered. The database also shall track annual and past due tests.

Cross-Connection Control Manual**TESTING PROCEDURES****Preparation for Testing Backflow Prevention Assemblies**

Prior to testing backflow prevention assemblies the backflow prevention technician shall:

1. Notify affected onsite personnel that the water service will be shut off during backflow prevention assembly testing.
2. Notify the authority having jurisdiction over fire protection systems, and any alarm-monitoring agency, that the water supply to the fire protection system will be shut off during the test procedure.
3. Examine the area for safety hazards, water leaks, or relief valve discharging.
4. Determine that the backflow prevention assembly is installed commensurate with the degree of hazard, pressure conditions, and required orientation.
5. Check that the assembly is the correct size and has the essential components for testing such as resilient seated, full ported shutoff valves and test ports.
6. Note the manufacturer, model, serial number, size, application, and physical location.

Backflow Prevention Assembly Testing

1. The Cross-Connection Control Program Manager is responsible for all backflow prevention assembly testing within the jurisdiction of the Directorate of the Environment.
2. All backflow prevention assemblies shall be tested for proper operation by backflow prevention technicians registered with the Cross-Connection Control Program Manager.
3. Testing shall take place at the time of installation, repair, or relocation and at least on an annual schedule thereafter or more often when required by the Cross-Connection Control Program Manager.
4. A copy of the test report indicating satisfactory operation of the backflow prevention assembly, and any repairs, shall be forwarded to the Cross-Connection Control Program Manager within one week from the time the test was completed.
5. Assemblies that fail the operational test shall be repaired, overhauled, and retested immediately by a recognized backflow prevention technician. Testing of the assemblies shall not be considered complete until a test report certifying that the assembly is operating correctly has been received by the Cross-Connection Control Program Manager.
6. Upon the completion of a satisfactory test, the backflow prevention technician shall attach a laminated tag to the assembly with the following information on one side:

Cross-Connection Control Manual**TESTING PROCEDURES**

"Directorate of the Environment, ATZC-DOE, Building 622, Fort Bliss, TX 79916, Phone: (915) 568-6364, Fax: (915) 568-1333"

The reverse side of the tag shall indicate the assembly's manufacturer, model, serial number, size, and tag number. The applicable values of check valves No. 1 & 2, relief valve, air inlet valve, check valve, and the test date shall also be indicated.

7. Testing of backflow prevention assemblies shall be in accordance with Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. The following steps shall be used when testing reduced pressure principal backflow prevention assemblies:

Reduced Pressure Principle

1. Determine the apparent static pressure drop across check valve No. 1 in the direction of flow.
2. Determine that the differential pressure relief valve operates to maintain the zone between the two check valves at least 2.0 psi less than supply pressure.
3. Determine that check valve No. 2 closes tight in reverse flow.
4. Determine that the confirmed static pressure drop across check valve No. 1 is at least 3.0 psi greater than the relief valve opening point.
5. Determine that the static pressure drop across check valve No. 2 is at least 1.0 psid.
6. Determine that the comparison of the two readings of check valve No. 1 (1 and 4) is within 1.0 psid.

Double Check Valve

1. Determine that the static pressure drop across check valve No. 1 is at least 1.0 psid.
2. Determine that the static pressure drop across check valve No. 2 is at least 1.0 psid.

Pressure Vacuum Breakers

1. Determine that the pressure in the body when the air inlet valve opens is at least 1.0 psi.
2. Determine that the static pressure drop across the check valve is at least 1.0 psid.

Cross-Connection Control Manual**TESTING PROCEDURES****Spill-Resistant Pressure Vacuum Breakers**

1. Determine that the pressure in the body when the air inlet valve opens is at least 1.0 psi.
2. Determine that the differential pressure of the check valve in the direction of flow shall be at least 1.0 psid.

Note: For the SVB to operate correctly, the check valve must have a greater value than the air inlet valve.

Test Equipment Calibration

1. Backflow prevention assembly test equipment shall be calibrated annually in accordance with ANSI and ASSE 1064 standards by a qualified calibration facility.
2. The test equipment manufacturer, model, serial number, and last date of calibration shall be recorded on the backflow prevention assembly test report form.

Maintenance and Repair

To maintain backflow prevention assemblies in proper operating condition, the technician shall adhere to the following:

1. Test assemblies in accordance with this manual.
2. Use currently calibrated testing equipment.
3. Consult manufacturer's repair/maintenance manuals.
4. Observe general safety procedures.
5. Use only manufacturer's replacement parts.
6. Be prepared to repair assembly at time of testing by maintaining an inventory of replacement parts.
7. Avoid flipping rubber check valve discs. Flipping shall be considered a temporary measure only to enable continuation of water service until a new replacement disc is installed.
8. Retest assembly for proper operation immediately following repair.
9. Slowly repressurize assembly when returning assembly to normal operating condition.

Cross-Connection Control Manual**TEST REPORT FORM**

Fort Bliss 0710020 Backflow Prevention Assembly Test Report ATZC-DOE, Building 622, Fort Bliss, TX 79916 Phone: (915) 568-1041 Fax: (915) 568-1333			
General Information Area / Range Camp _____ Building Name _____ Building Number _____ Building Location _____ Point of Contact _____ Phone _____			
Current Assembly Information Manufacturer _____ Model _____ Serial No. _____ Size _____ Tag _____ Type of service: <input type="checkbox"/> Containment/Domestic <input type="checkbox"/> Containment/Fire System <input type="checkbox"/> Containment/Lawn Irr. <input type="checkbox"/> Isolation Specific physical location of assembly: _____ Equipment or system isolated: _____		Removed Assembly Information Manufacturer _____ Model _____ Size _____ Serial No. _____ <hr/> Gauge Information ID _____ Manufacturer _____ Model _____ Serial No. _____ Last date of calibration _____	
Test Results Status <input type="checkbox"/> Pass <input type="checkbox"/> Fail		Additional Requirements <input type="checkbox"/> Yes <input type="checkbox"/> N/A Thermal Expansion Control Present? <input type="checkbox"/> No <input type="checkbox"/> Unknown (Containment domestic only) Requirements made known? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
RP CV1 AR _____ RV _____ CV2 Tight? <input type="checkbox"/> Yes <input type="checkbox"/> No CV1 CR _____ CV2 _____ Buffer _____	DC CV1 _____ CV2 _____	Adequate Freeze Protection Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Requirements made known? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
PVB SVB AIV _____ CV _____		Comments or Repairs made: _____ _____ Test Type <input type="checkbox"/> Initial <input type="checkbox"/> Annual <input type="checkbox"/> Repair <input type="checkbox"/> Relocate	
<p>The backflow prevention assembly detailed on this report has been tested and maintained as required and is certified to be operating within acceptable parameters.</p> <p>I also certify that I tested this assembly and the test results are true.</p> Technician ID _____ Name _____ Phone _____ Signature _____ Time of Test _____ Date _____ Firm _____ Address _____ City _____ State _____ Zip _____			

**This form may be recreated from the
Testing Database**

Cross-Connection Control Manual**BACKFLOW PREVENTION METHODS, DEVICES, AND ASSEMBLIES**

Backflow Prevention Method, Device, and Assembly Application Table						
	Sewage	Hazards		Pressures		
		Health	Non-health	Back-Pressure	Back-Siphonage	Continuous Pressure
AG	Yes	Yes	Yes	Yes	Yes	Yes
AVB	No	Yes	Yes	No	Yes	No
DC	No	No	Yes	Yes	Yes	Yes
PVB	No	Yes	Yes	No	Yes	Yes
RP	No	Yes	Yes	Yes	Yes	Yes
SVB	No	Yes	Yes	No	Yes	Yes

AG	Air gap
AVB	Atmospheric vacuum breaker
DC	Double check valve assembly
PVB	Pressure vacuum breaker assembly
RP	Reduced pressure principle assembly
SVB	Spill-Resistant pressure vacuum breaker assembly

Backflow prevention methods, devices, and assemblies shall be installed and maintained in accordance with the proper degree of hazard, pressure condition, and orientation.

The AVB, PVB, SVB, and RP shall be used where health hazard matters are concerned. The DC shall only be used in non-health applications where convenience such as not draining the premises potable water system is the concern.

Cross-Connection Control Manual**CONTAINMENT CONTROL REQUIREMENTS****Containment Cross-Connection Control**

1. No water service connection shall be permitted to any premises handling substances deleterious or hazardous to the public health without an air gap separation or an approved backflow prevention assembly installed at the water service connection.
2. Table "Minimum Containment Requirements" shows typical installations that require backflow prevention assemblies at the water service connections of the premises. This table may be supplemented by the Cross-Connection Control Program Manager upon the discovery of a potential hazard to the public water supply.

The table does not indicate use of the double check valve assembly (DC) in containment applications. The use of a DC must be restricted to non-health use only. The Cross-Connection Control Program Manager may allow the use of existing DCs on potable water supplies serving fire protection systems if the hydraulic design of the system cannot accommodate the pressure loss of a RP. Once performance of the water distribution system is upgraded existing fire protection systems shall be fitted with RPs.

3. All approved backflow prevention methods, devices, and assemblies shall be installed in their required orientation, in accordance with the proper degree of hazard and pressure condition as indicated in this manual.
4. Premises considered to pose a threat of contamination to the water distribution system shall be subject to a water use inspection. The Directorate of the Environment or its representatives shall have the right of entry to any land or buildings at reasonable times to make water use examinations or inspections. If cross connections are discovered during the premises water use survey that could result in the backflow of contaminants into the public water supply, Ft. Bliss shall immediately implement appropriate corrective actions.
5. At any premises where contamination hazards exist and there is adequate isolation cross-connection control in effect, the Cross-Connection Control Program Manager may determine that an air gap separation or an approved backflow prevention assembly may not be required at the water service connection.

Cross-Connection Control Manual

CONTAINMENT CONTROL REQUIREMENTS

This table is not an all-inclusive list and may be supplemented by the Cross-Connection Control Manager.

Backflow prevention methods, devices, and assemblies shall be installed and maintained in accordance with the proper degree of hazard, pressure condition, and orientation.

Typical premises or water uses that require containment control:	Method or assembly
Agricultural	AG or RP
Aircraft, missile plant	AG or RP
Animal grooming, processing, feedlot	AG or RP
Automotive repair, plant	AG or RP
Auxiliary water supply	AG or RP
Beverage processing	AG or RP
Cannery, packing house, rendering plant	AG or RP
Car washing	AG or RP
Chemical manufacturing	AG or RP
Clinic	AG or RP
Cold storage facility	AG or RP
Commercial laundry	AG or RP
Complex piping system	AG or RP
Construction water service point	AG or RP
Cooling system	AG or RP
Dairy, product processing	AG or RP
Dental office, laboratory	AG or RP
Docks, dockside facility	AG or RP
Dye plant	AG or RP
Fire protection system	AG or RP
Food processing plant	AG or RP
Garment finisher	AG or RP
Green house	AG or RP
Heating system	AG or RP
Hospital, mortuary, funeral home	AG or RP
Industrial system	AG or RP
Laundry	AG or RP

Cross-Connection Control Manual

Typical premises or water uses that require containment control:	Method or assembly
Lawn irrigation system	AG or RP
Lease space (shopping center, warehouse)	AG or RP
Manufacturing natural or synthetic rubber	AG or RP
Medical, surgical	AG or RP
Metal finishing, molding, forming, plating	AG or RP
Microchip fabrication	AG or RP
More than one connection to the public water supply	AG or RP
Nursing, convalescent home	AG or RP
Paper processing	AG or RP
Petroleum processing, storage	AG or RP
Photographic processing	AG or RP
Plastic injection	AG or RP
Power plant	AG or RP
Radiator shop	AG or RP
Radioactive material	AG or RP
Ready mix concrete	AG or RP
Reclaimed potable water system	AG or RP
Sand, gravel plant	AG or RP
School, laboratory	AG or RP
Sewage lift station, treatment plant	AG or RP
Slaughter house	AG or RP
Steam generating	AG or RP
Tall buildings	AG or RP
Taxidermy	AG or RP
Temporary service	AG or RP
Toxic substance	AG or RP
Uncontrolled cross connections	AG or RP
Veterinary	AG or RP
Water Storage vehicle	AG or RP
Water treatment	AG or RP
Well	AG or RP
Where inspection is restricted	AG or RP

Cross-Connection Control Manual
ISOLATION CONTROL REQUIREMENTS

Isolation Cross-Connection Control

1. No installation of any water operated equipment that may cause contamination of the premises potable water system shall be permitted unless it is equipped with an approved backflow prevention method, device, or assembly.
2. Requirements for backflow prevention methods, devices, and assemblies installed within the premises potable water system are for the safety and protection of the occupants of the premises.
3. In addition to performing cross-connection control surveys, the Cross-Connection Control Program Manager shall conduct inspections in response to water quality complaints to determine compliance with the provisions of the Cross-Connection Control Program. In the event cross connections require isolation control, the Cross-Connection Control Program Manager shall have approved backflow prevention methods, devices, and assemblies installed at specific locations within the premises potable water system.
4. Mandatory isolation cross-connection control requirements are shown in the table, "Minimum Isolation Cross-Connection Control Requirements" on page 21. This table is not an all-inclusive list of hazards that may be found and may be supplemented by the Cross-Connection Control Manager.
5. All approved backflow prevention methods, devices, and assemblies shall be installed in their required orientation, in accordance with the proper degree of hazard, and pressure condition as indicated in this manual.

Cross-Connection Control Manual
ISOLATION CONTROL REQUIREMENTS

This table is not an all-inclusive list and may be supplemented by the Cross-Connection Control Manager.

Backflow prevention methods, devices, and assemblies shall be installed and maintained in accordance with the proper degree of hazard, pressure condition, and orientation.

Typical water uses that require isolation control:	Method, device, or type of assembly					
	AG	RP	DC	PVB	SVB	AVB
Air conditioning system	Yes	Yes	No	Yes	Yes	Yes
Air washer	Yes	Yes	No	Yes	Yes	Yes
Aspirator	Yes	Yes	No	Yes	Yes	Yes
Autoclave	Yes	Yes	No	No	No	No
Auxiliary water supply	Yes	Yes	No	No	No	No
Bedpan washer	Yes	Yes	No	Yes	Yes	Yes
Boiler	Yes	Yes	No	No	No	No
Carbonation equipment	Yes	Yes	No	No	No	No
Chemical dispenser	Yes	Yes	No	Yes	Yes	Yes
Chilled potable water system	Yes	Yes	No	No	No	No
Chiller	Yes	Yes	No	No	No	No
Compressors (water cooled)	Yes	Yes	No	No	No	No
Cooling tower	Yes	Yes	No	No	No	No
Cuspidor	Yes	Yes	No	Yes	Yes	Yes
Decorative pond	Yes	Yes	No	Yes	Yes	Yes
Degreasing equipment	Yes	Yes	No	No	No	No
Drinking fountain	Yes	Yes	No	No	No	No
Evaporative cooler	Yes	Yes	No	Yes	Yes	Yes
Faucet with pull-out spout	Yes	Yes	No	Yes	Yes	Yes
Fire protection system	Yes	Yes	No	No	No	No
Fountains	Yes	Yes	No	Yes	Yes	Yes
Garbage disposal	Yes	Yes	No	Yes	Yes	Yes
Domestic heat exchanger	Yes	No	No	No	No	No
Heating system	Yes	Yes	No	No	No	No
Hose bibb	Yes	Yes	No	Yes	Yes	Yes
Hydrant (wall, yard)	Yes	Yes	No	Yes	Yes	Yes

Cross-Connection Control Manual**ISOLATION CONTROL REQUIREMENTS**

Typical water uses that require isolation control:	Method, device, or type of assembly					
	AG	RP	DC	PVB	SVB	AVB
Industrial fluid	Yes	Yes	No	Yes	Yes	Yes
Kitchen equipment	Yes	Yes	No	Yes	Yes	Yes
Laboratory equipment	Yes	Yes	No	Yes	Yes	Yes
Lawn irrigation system	Yes	Yes	No	Yes	Yes	Yes
Medical equipment	Yes	Yes	No	Yes	Yes	Yes
Non-potable potable water system	Yes	Yes	No	No	No	No
Non-pressure vessel	Yes	Yes	No	Yes	Yes	Yes
Photo processing equipment	Yes	Yes	No	Yes	Yes	Yes
Pressure vessel	Yes	Yes	No	No	No	No
Receptors such as tanks, vats, sumps	Yes	Yes	No	Yes	Yes	Yes
Reclaimed water	Yes	Yes	No	No	No	No
Sewer, pump, ejector	Yes	Yes	No	No	No	No
Shampoo basin	Yes	Yes	No	Yes	Yes	Yes
Shower with hose	Yes	Yes	No	Yes	Yes	Yes
Sink (hand, janitor, dish, etc.)	Yes	Yes	No	No	No	No
Solar water heating equipment	Yes	Yes	No	No	No	No
Sterilizer	Yes	Yes	No	No	No	No
Swimming pool	Yes	Yes	No	Yes	Yes	Yes
Trap primer	Yes	Yes	No	No	No	No
Tub	Yes	Yes	No	Yes	Yes	Yes
Urinal	Yes	Yes	No	Yes	Yes	Yes
Water closet	Yes	Yes	No	Yes	Yes	Yes
Water closet flushometer tank	Yes	Yes	No	Yes	Yes	Yes
Water cooled equipment	Yes	Yes	No	Yes	Yes	Yes
Watering trough	Yes	Yes	No	Yes	Yes	Yes

Cross-Connection Control Manual**GENERAL REQUIREMENTS****Auxiliary Water Systems and/or Wells**

Premises having auxiliary water systems and/or wells that are connected to the water distribution system shall have the following options:

1. Permanently abandon use of the auxiliary water system and/or well by "plugging the well" in accordance with the Directorate of the Environment, or
2. Completely and permanently, sever the auxiliary water system and/or well from the potable water system in accordance with the Directorate of the Environment and install an air gap or a reduced pressure principle backflow prevention assembly at the water service connection.

Backflow Prevention Assembly Enclosures

1. Backflow prevention assemblies may be installed indoors provided provisions for drainage and accessibility for testing and maintenance are met.
2. Backflow prevention assemblies installed outdoors shall meet the following requirements:
 - a. Color (color shall be appealing to Fort Bliss's overall color scheme).
 - b. Durability (ability to withstand weather extremes, wind, sand, temperature change and remain exceptionally tough).
 - c. Vandal Protection: (ability to withstand hits, kicks, etc... without denting or cracking, intruder resistant and tagging resistant)
 - d. UV Protection (prevent discolorations of fabrics or breakdown of materials)
 - e. Vector Resistant (does not provide a habit for poisons vectors such as black widow, brown recluse, scorpions, rattle snakes, etc.).
 - f. Design (adequate drainage, protect from freezing, easily accessible for testing, maintenance, and repair).
3. Enclosures must be installed and maintained so that backflow prevention assemblies are safely accessible for testing, maintenance, and repair.

Carbonators

1. Water supplies to carbonators shall be provided with a reduced pressure backflow prevention assembly.
2. There shall be no copper piping between the assembly and carbonator equipment.

Chemical Dispensers

1. Water supplies to chemical dispensers shall be provided with an air gap, reduced pressure backflow prevention assembly, or a spill resistant pressure vacuum breaker assembly.

Cross-Connection Control Manual**GENERAL REQUIREMENTS**

2. Chemical dispensers shall be supplied directly from the premises potable water system.
3. Chemical dispensers shall not be supplied from other fixtures such as janitor sink faucets.

Construction Water Service

1. The Cross-Connection Control Program Manager shall designate a hydrant or stand pipe to assist contractors during construction.
2. A water meter and a reduced pressure backflow prevention assembly shall be maintained at all times of operation at the hydrant or stand pipe.

Fire Protection Systems

1. Fire protection systems are systems of pipes and equipment used exclusively to supply water for extinguishing fire. Potable water supplies serving new and existing fire protection systems, including but not limited to standpipes and automatic sprinkler systems, shall be protected with an air gap or a reduced pressure principle assembly.
2. Whenever a backflow prevention assembly is installed in the potable water supply to a new fire protection system, the hydraulic design of the system shall account for the pressure drop through the assembly.
3. Whenever a backflow prevention assembly is retrofitted in the potable water supply to an existing fire protection system, the hydraulic design of the system shall be checked to verify that there is sufficient water pressure available for satisfactory operation of the system.
4. The hydraulic design calculations for new and existing fire protection systems shall be submitted to the Cross-Connection Control Program Manager for approval prior to the installation.

Heat Exchangers

1. Heat exchangers used for domestic water heat transfer shall be double walled.
2. Single wall heat exchanges shall be prohibited and removed from operation as per UPC.

Labeling

1. To prevent sanitary fixtures from being connected to non-potable waters, and for safety and sanitation, the UPC requires that each plumbing fixture be provided with potable water.
2. In all buildings where potable water and non-potable water systems are installed, each system shall be clearly identified. Labels designating the liquid

Cross-Connection Control Manual**GENERAL REQUIREMENTS**

or gas being conveyed and the direction of flow will be colored coded as follows:

Potable water — green background with white lettering.

Nonpotable water — yellow background with black lettering.

3. The labeling shall occur every twenty feet and at least once per room, and shall be visible from floor level.
4. Each outlet and hose bibb in the nonpotable system shall be posted: "CAUTION: NONPOTABLE WATER, DO NOT DRINK"

Lawn Irrigation Systems

1. A person may not sell, design, consult, install, maintain, alter, repair, or service an irrigation in Texas unless the person is a licensed irrigator by the TCEQ. A person who is licensed as an installer may only connect an irrigation system to a water supply while being under the direct supervision of a licensed irrigator.
2. The premises potable water system shall be protected from lawn irrigation systems with an approved atmospheric vacuum breaker, pressure vacuum breaker, spill-resistant pressure vacuum breaker, or reduced pressure assembly installed commensurate with the device's/assembly's pressure condition and required orientation.
3. The water distribution system shall be protected from lawn irrigation systems with an approved pressure vacuum breaker, spill-resistant pressure vacuum breaker, or reduced pressure assembly installed commensurate with the assembly's pressure condition and required orientation.

Make up Water to Boilers and Chillers

1. Make up water connections to steam and hot water boilers shall be provided with a reduced pressure backflow prevention assembly.
2. The assembly shall be located in the inlet piping to the boiler's pressure reducing valve.

New Water Service Connections

The Cross-Connection Control Manager shall review all requests for new water service connections to determine if containment cross-connection control is needed. If it is determined that a containment backflow prevention assembly is required, the assembly must be installed, inspected and tested for proper operation before water service is established.

Cross-Connection Control Manual**GENERAL REQUIREMENTS****Parallel Installations**

1. Parallel installations of two or more backflow prevention assemblies of the same type is an effective means of insuring that uninterrupted water service is maintained during testing or repair, and is strongly recommended when such continuity is desired. Parallel installations shall be in accordance with the "Parallel Installation Table" on page 26.
2. The design and plan of implementation for parallel installations shall be submitted to the Cross-Connection Control Program Manager for approval prior to the installation.
3. Sites with service lines 10" or less shall utilize at least one line-sized assembly.
4. Where two line-sized assemblies are installed in parallel, one of the assemblies shall remain closed.
5. Sites with service lines 12" or larger shall utilize assemblies sized in accordance with the "Parallel Installation — Rated Flow Table" on page 12. The combined flow capacity of the parallel assemblies shall equal or exceed the flow capacity of the service line. For example: The combined flow capacity of two 8" assemblies (2 x 1600 gpm = 3200 gpm) would be sufficient on a 12" water service line (3000 gpm).
6. During testing and repair of parallel assemblies, the flow demand shall be reduced to match the flow rate of the remaining "on line" assembly. When a parallel assembly is left closed during normal operation, it shall be tested for proper operation before the main assembly is tested.
7. Where three parallel assemblies are sized in accordance with the "Parallel Installation — Rated Flow Table", one of the assemblies shall remain closed.

Parallel Installation Table		
Application	Service lines 10" and less	Service lines 12" and larger
Site can tolerate interruption of water service.	1 line sized BFP	2 rated flow sized BFPs in parallel
Site cannot tolerate interruption of water service, but can operate with reduced flow.	1 line sized BFP and one smaller in parallel to match reduced flow demand	2 rated flow sized BFPs in parallel
Site cannot tolerate interruption of water service or reduced flow.	2 line sized BFPs in parallel	3 rated flow sized BFPs in parallel

Cross-Connection Control Manual**GENERAL REQUIREMENTS**

Parallel Installation - Rated Flow	
Size of assembly or service line	Rated flow (gpm)
2-1/2	225
3	320
4	500
6	1000
8	1600
10	2300
12	3000
14	3700
16	4400

Tenant and Lease Facilities

1. Tenant and lease facilities such as fast food restaurants, service stations, snack bars, and sites used or managed by other than Ft. Bliss personnel, are considered to be premises having potable water systems that are impractical to ascertain whether or not proper isolation cross-connection control exists. Tenant / Lease facilities will require containment cross-connection control.
2. The Cross-Connection Control Manager shall maintain jurisdiction of containment backflow prevention assemblies on tenant and lease facilities and shall be included in the annual testing schedule.

Thermal Expansion

1. The installation of "non-return devices" such as backflow prevention assemblies, check valves, dual check valves, pressure reducing or pressure regulating valves, and water softeners between the water service connection and the domestic water heater may create a "closed domestic potable water system" preventing pressure relief through the building supply.
2. A UPC listed thermal expansion tank shall be installed between the "non return device" and the water storage tank heated by indirect means and heat input limited to 200,000 Btu/hr, water temperature limited to 210° F, and water capacity that does not exceed 120 gallons.
3. A thermal expansion tank shall be provided in accordance with ASME Code, Section VIII, Division 1, on boilers operating at pressures not exceeding 160 psig and water temperatures not exceeding 210° F when either of the following limitations is exceeded: heat input of 200,000 Btu/hr; or nominal

Cross-Connection Control Manual**GENERAL REQUIREMENTS**

water-containing capacity of 120 gallons (Texas Department of Licensing and Regulation, 16 Texas Administrative Code, Chapter 65). The thermal expansion tank shall be located on the cold water supply, the tank's air pressure matched to the system water pressure, and sized to total water heater capacity and supply pressure.

4. The backflow prevention technician shall indicate on the backflow prevention assembly test report form if the requirements for thermal expansion control are met.

Water Closets and Urinals

1. Water closet and urinal flushometer valves shall be equipped with an UPC listed atmospheric vacuum breaker.
2. The critical level of the vacuum breaker shall be at least six inches above the flood level rim of a water closet or the highest part of the urinal.
3. Water closet and urinal tanks shall be equipped with a UPC listed ball cock.

Water Treatment Units

Waste or discharge from reverse osmosis or other types of water treatment units shall enter the drainage system through an air gap.

Cross-Connection Control Manual
GENERAL REQUIREMENTS

Cross-Connection Control Manual**AIR GAP****Defined**

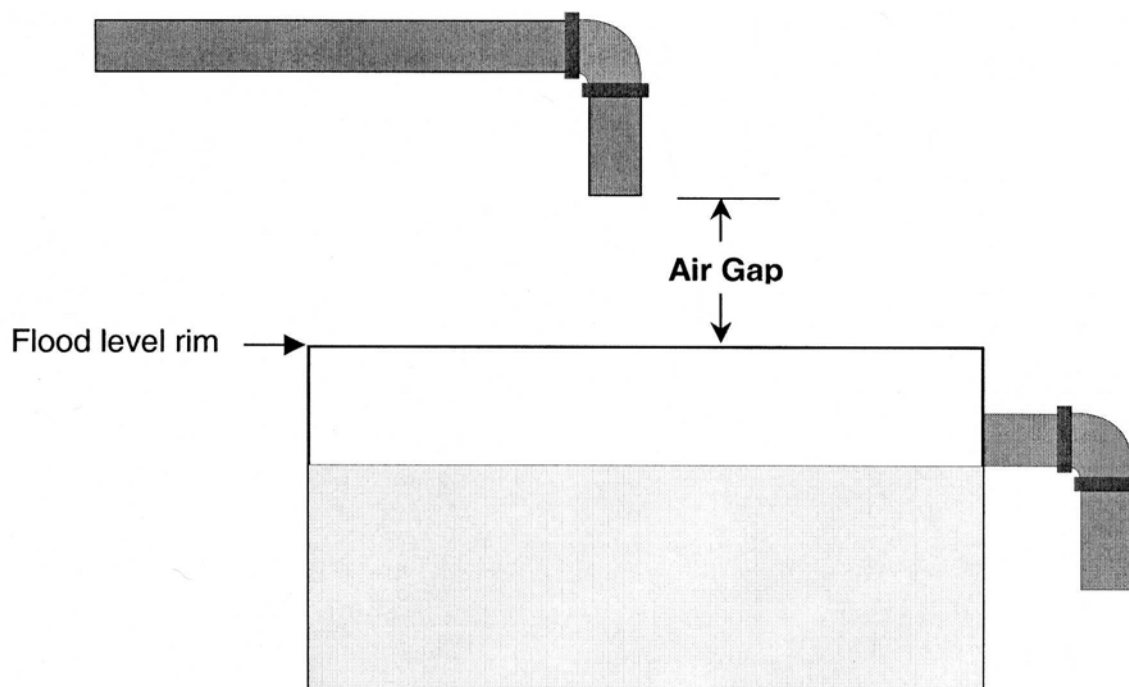
An air-gap is the unobstructed vertical distance through the free atmosphere between the discharge end of a potable water supply pipe and the flood level rim of an open or non-pressure vessel

Installation Requirements

1. The air gap must be at least twice the diameter of the water supply outlet above the flood level rim of a non-vessel or one inch, whichever is greater.
2. The air gap shall be installed with adequate access and clearance for inspection and located outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
3. A permanent platform is necessary whenever the air gap is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.

Inspection Requirements

Air gaps shall be inspected at the time of installation. In conjunction with testing backflow prevention assemblies at a particular site, or other activities, the technician shall inspect all air gaps to verify that the required vertical distance is maintained and that there is no hose connected to it. The air gap may be inspected more often when required by the Cross-Connection Control Program Manager.



Cross-Connection Control Manual
ATMOSPHERIC VACUUM BREAKER

Defined

An atmospheric vacuum breaker consists of a float check, check seat, and an air inlet port. The AVB shall protect against health hazards under backsiphonage conditions only.

Installation Requirements

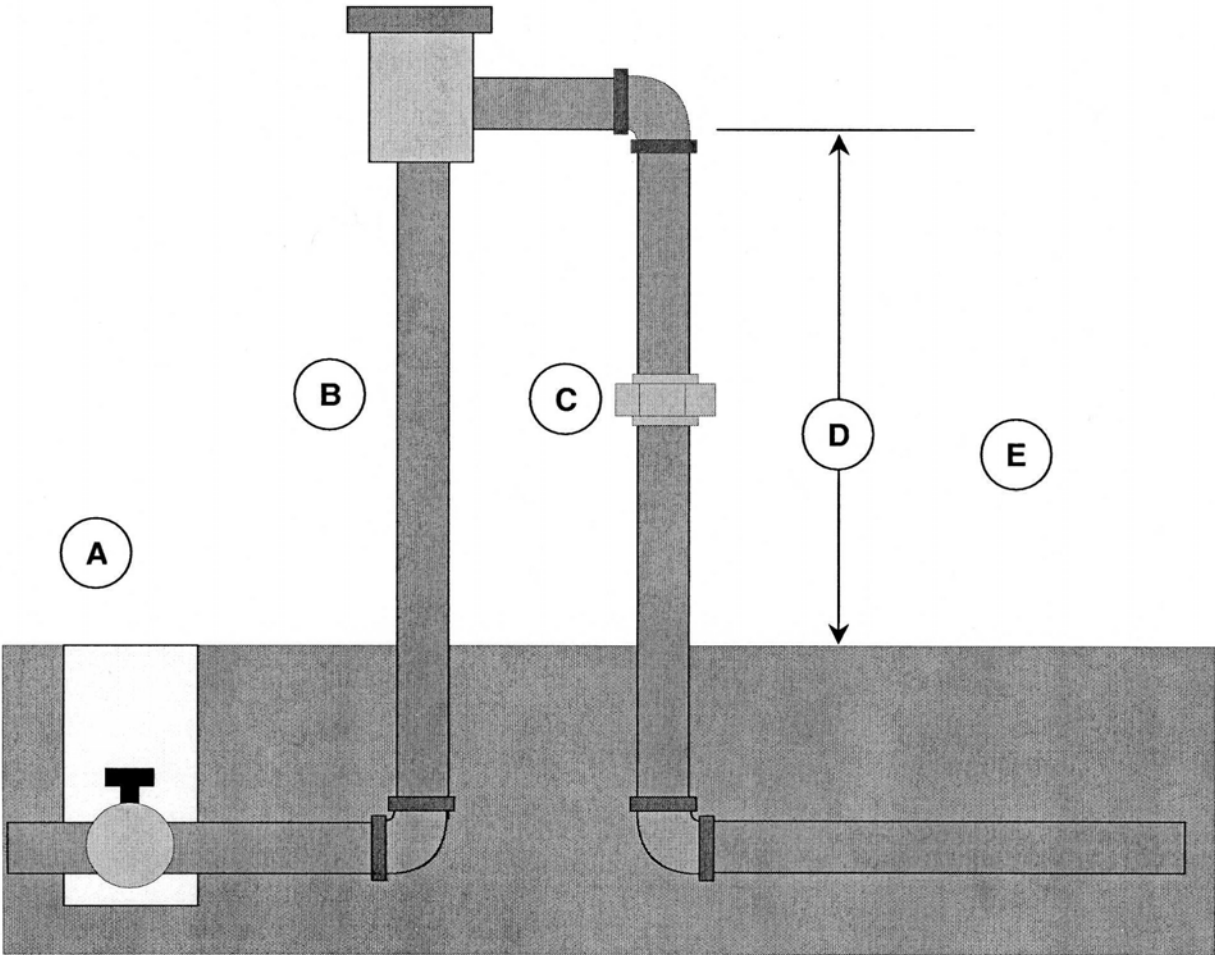
1. The AVB shall be used in isolation applications only. It shall not be used in containment applications.
2. The AVB shall be installed between 6" and 60" above grade, floor, or platform and at a minimum of 6" above the highest point of the device's outlet piping. The installation shall include unions.
3. There shall be no valves in the outlet piping of the AVB.
4. There shall be adequate drainage provisions to accommodate water discharge from flushing and operation.
5. Whenever the AVB is insulated, the insulation must be easy to remove in order to facilitate inspection and repair.
6. AVBs must be installed horizontal and plumb.
7. Immediately after installation and before service is restored, the device must be thoroughly flushed. This is accomplished by completely removing the float check and opening the inlet shut-off valve to flush debris that may foul the device.
8. The size of the AVB shall not be less than the size of the water supply piping.
9. The AVB shall be installed in accordance with the device's operating pressure and temperature rating.
10. The AVB shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
11. A permanent platform is necessary whenever the device is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the device and must meet all applicable safety standards and codes.
12. The AVB shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

Inspection Requirements

The AVB shall be inspected at the time of installation and on an annual schedule thereafter or more often when required by the Cross-Connection Control Program Manager.

Cross-Connection Control Manual

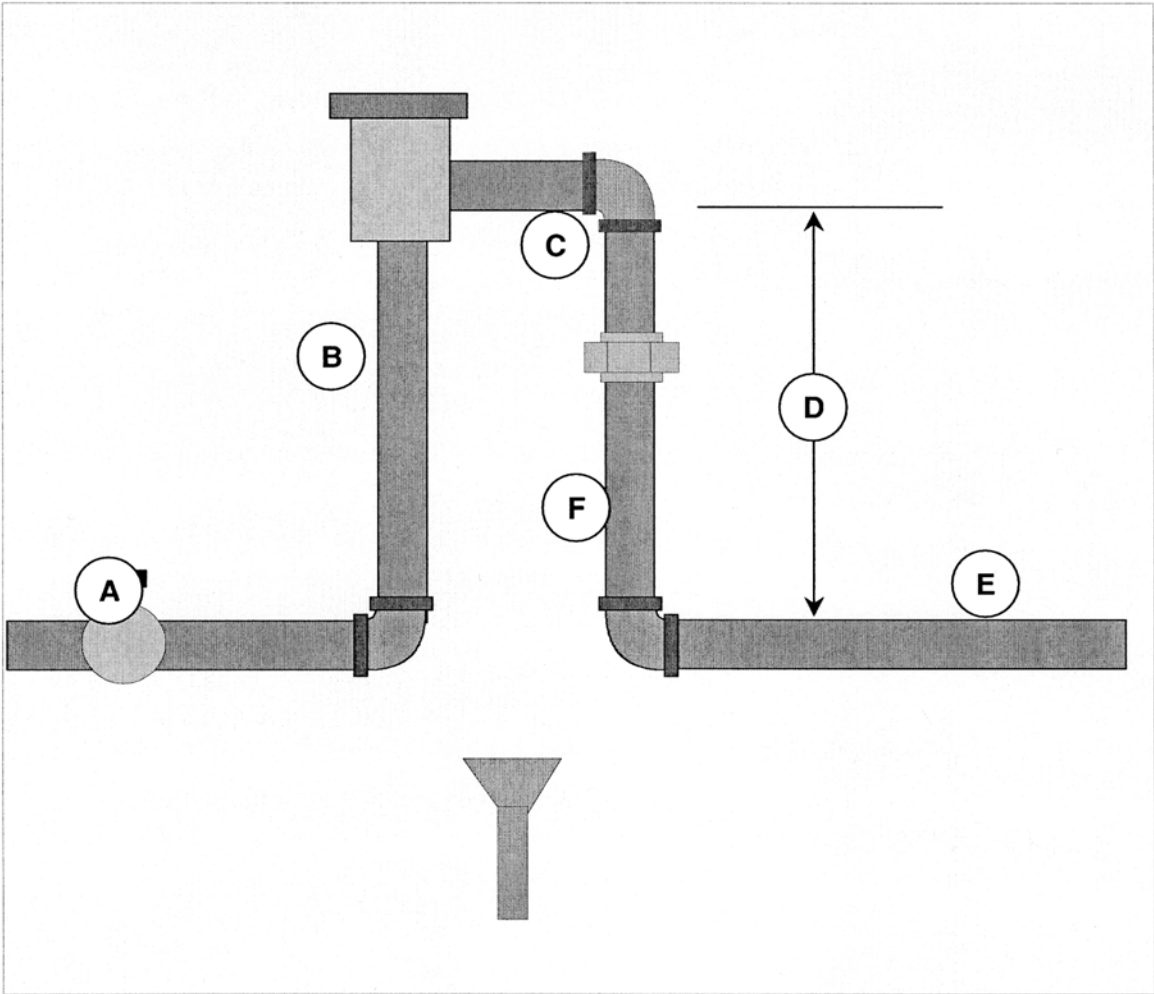
ATMOSPHERIC VACUUM BREAKER



Outdoor Isolation Installation	
A	Shut off valve
B	Service line — cement lined ductile iron, copper, or galvanized piping
C	Union — above grade
D	Minimum 6" above grade and all outlet piping. Installations more than 60" above grade or floor require a permanent platform.
E	No valves allowed in outlet piping

Cross-Connection Control Manual

ATMOSPHERIC VACUUM BREAKER



Outdoor Isolation Installation	
A	Shut off valve
B	Service line — cement lined ductile iron, copper, or galvanized piping
C	Union
D	Minimum 6" above grade and all outlet piping. Installations more than 60" above grade or floor require a permanent platform.
E	No valves allowed in outlet piping
F	Provide adequate drainage

Cross-Connection Control Manual
DOUBLE CHECK VALVE ASSEMBLY**Double Check Valve Assembly Defined**

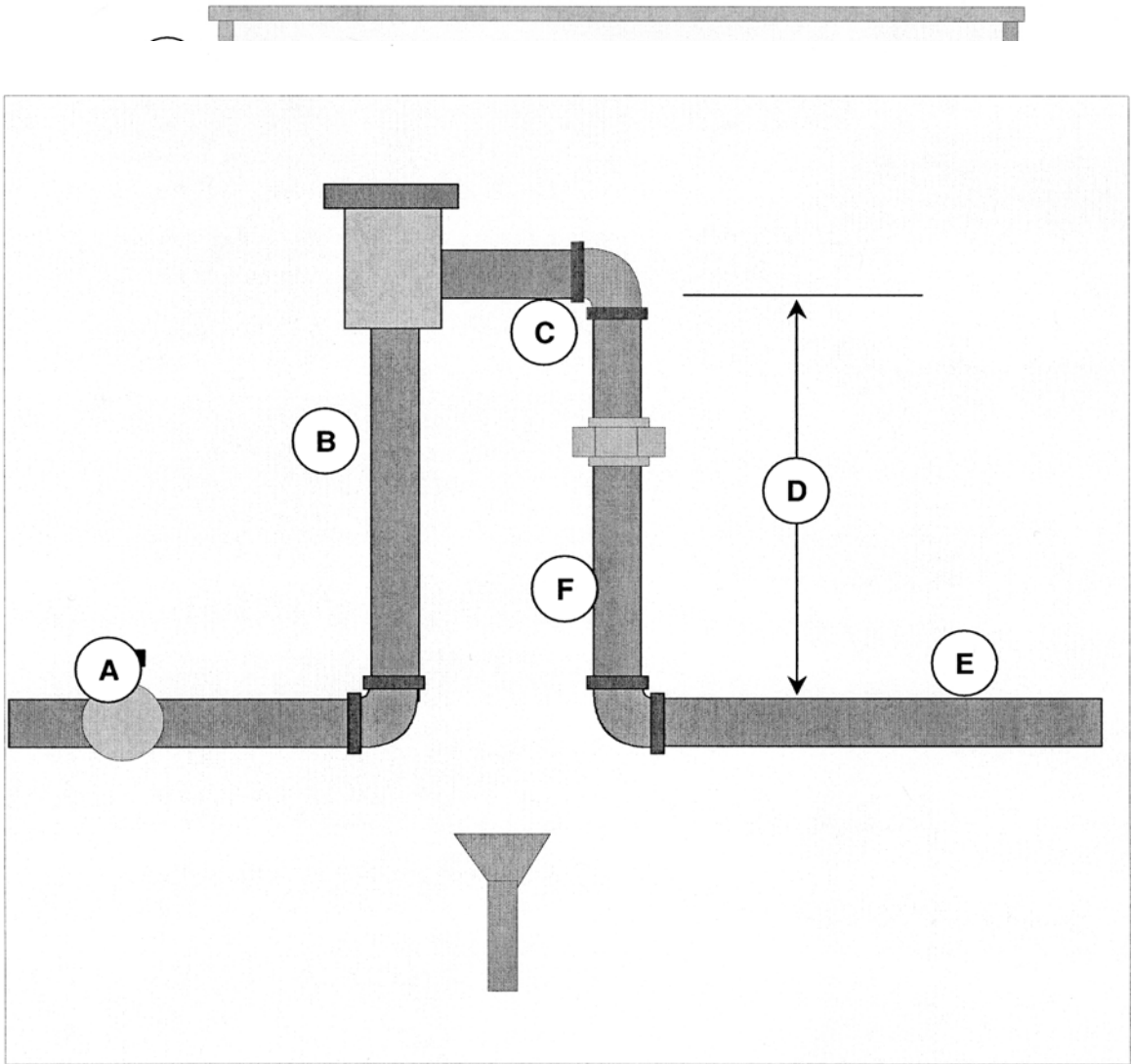
A double check valve backflow prevention assembly consists of two independently acting internally loaded check valves, four properly located resilient seated test ports, and two resilient seated isolation valves at each end of the assembly.

Installation Requirements

1. The DC must be installed between 12" and 36" above grade from the lowest part of the assembly for outdoor installations, and between 12" and 60" above floor or grade from the lowest part of the assembly for indoor installations.
2. The DC shall not be subjected to flooding. There shall be adequate drainage provisions to accommodate water discharge from flushing and testing.
3. Whenever the DC is insulated, the insulation must be easy to remove in order to facilitate testing and repair.
4. DCs must be installed horizontal and plumb unless specifically noted in the "List of Approved Backflow Prevention Assemblies" published by FCCCHR.
5. Thermal expansion and/or water hammer in the outlet piping of the assembly can cause excessive pressure (backpressure). A water hammer arrestor, thermal expansion tank, resilient seated check valve, or surge suppresser installed in the outlet piping is recommended to avoid damage to the piping system and the assembly.
6. Assemblies 2-1/2" and larger must be adequately supported.
7. Immediately after installation and before the assembly is tested or service is restored, the assembly must be thoroughly flushed. This is accomplished by completely removing the No. 1 check valve and opening the No. 1 shut-off valve to flush debris that may foul the assembly.
8. The size of the DC shall not be less than the size of the water supply piping.
9. The DC shall be installed in accordance with the assembly's operating pressure and temperature rating
10. The DC shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
11. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
12. The DC shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

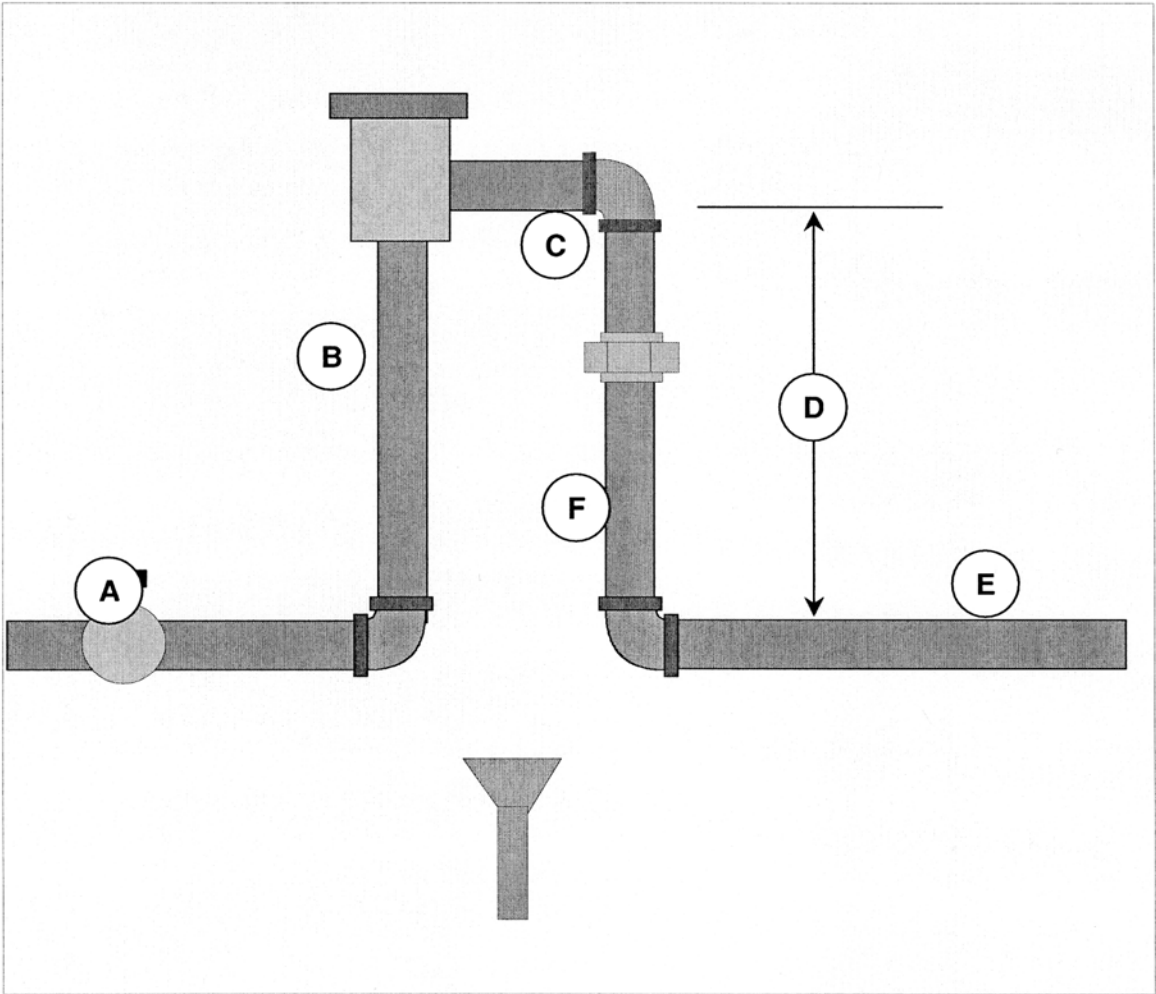
Cross-Connection Control Manual

DOUBLE CHECK VALVE ASSEMBLY



Outdoor Installation	
A	Shutoff valve and valve box
B	Thrust blocking
C	Service line — cement line ductile iron, copper, or galvanized piping
D	Sleeve with insulation (typical)
E	4" concrete slab (3000 psi, reinforced w/1/2 rebar & 4" mesh, scored)
F	12" minimum / 36" maximum from lowest part of assembly
G	Metal supports on assemblies 2½" and greater (typical)
H	Unions or flanges — above grade (typical)

Cross-Connection Control Manual



Indoor Installations	
A	Service line — cement lined ductile iron, copper, or galvanized piping
B	Sleeve with insulation (typical)
C	12" minimum / 36" maximum from lowest part of assembly
D	Metal supports
E	Unions or flanges
F	Provide adequate drainage

Cross-Connection Control Manual**PRESSURE VACUUM BREAKER****Defined**

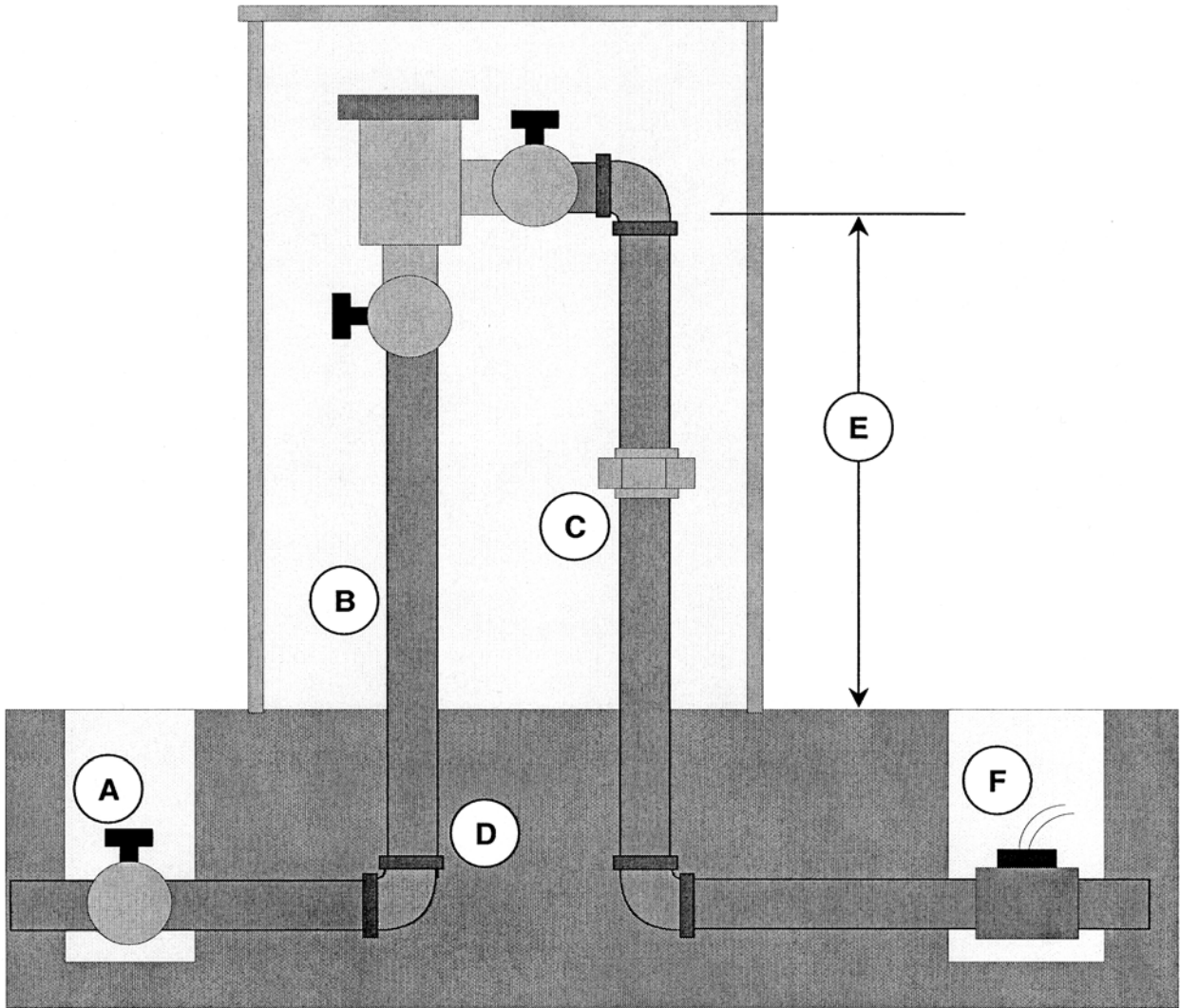
A pressure vacuum breaker assembly consists of an independently operating internally loaded check valve and an independently operating loaded air inlet valve on the discharge side of the check valve. The assembly shall be equipped with two properly located resilient seated test ports and two resilient seated isolation valves at each end of the assembly.

Installation Requirements

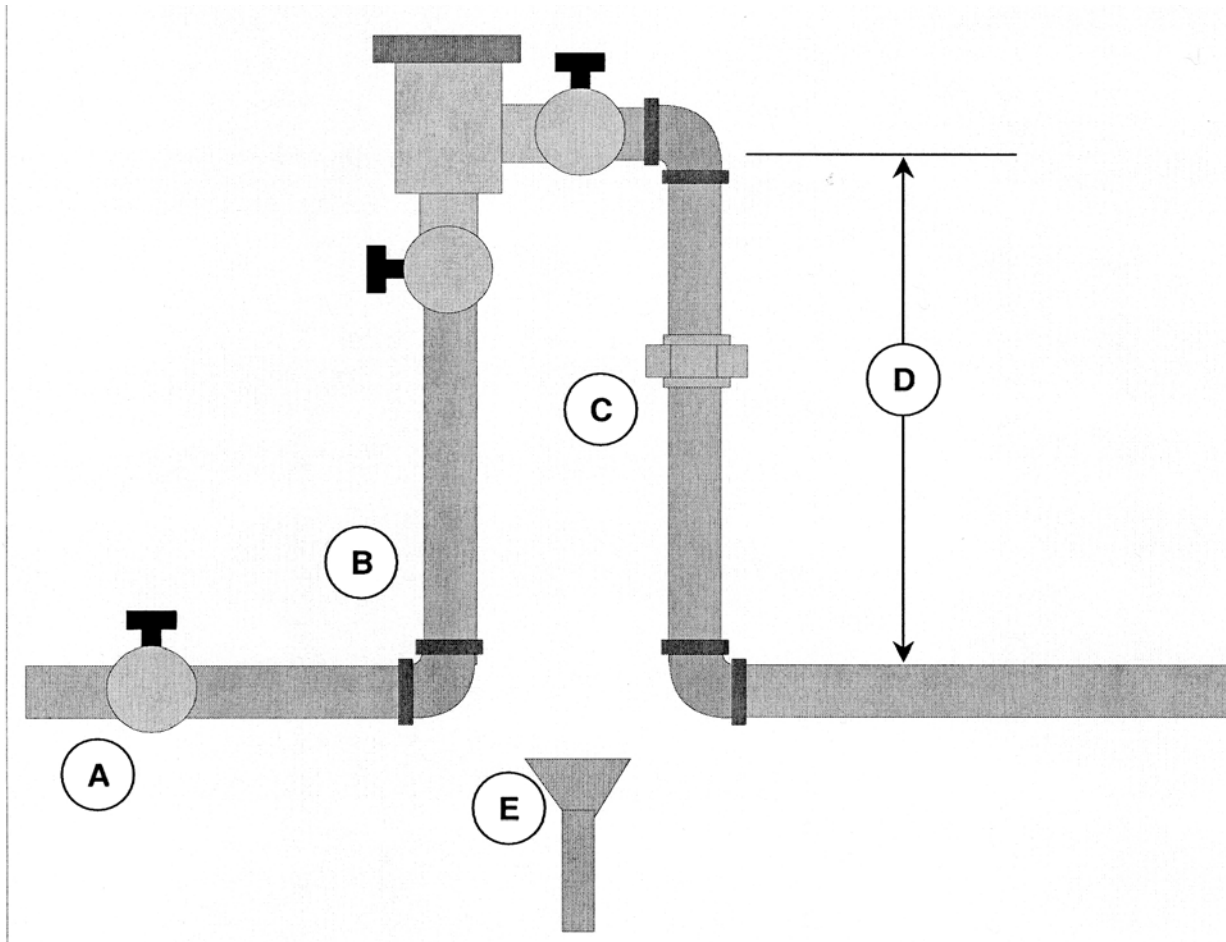
1. The PVB shall be installed between 12" and 60" above grade, floor, or platform and at a minimum of 12" above the highest point of the assembly's outlet piping. The assembly installation shall include unions.
2. There shall be adequate drainage provisions to accommodate water discharge from flushing and testing.
3. Whenever the PVB is insulated, the insulation must be easy to remove in order to facilitate testing and repair.
4. PVBs must be installed horizontal and plumb.
5. Immediately after installation and before the assembly is tested or service is restored, the assembly must be thoroughly flushed. This is accomplished by completely removing the air inlet valve and the check valve and opening the No. 1 shut-off valve to flush debris that may foul the assembly.
6. The size of the PVB shall not be less than the size of the water supply piping.
7. The PVB shall be installed in accordance with the assembly's operating pressure and temperature rating.
8. The PVB shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
9. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
10. The PVB shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.
11. In containment applications, the PVB shall only be used for dedicated lawn irrigation systems such as parks, medians, and golf courses.

Cross-Connection Control Manual

PRESSURE VACUUM BREAKER



Outdoor Installations	
A	Shut off valve
B	Service line — cement lined ductile iron, copper, or galvanized piping
C	Union — above grade
D	Protective enclosure
E	Minimum 12" above grade and all outlet piping. Installations more than 60" above grade or floor require a permanent platform
F	Master or zone valve — if applicable

Cross-Connection Control Manual**PRESSURE VACUUM BREAKER**

Indoor Installation	
A	Shut off valve
B	Service line — cement lined ductile iron, copper, or galvanized piping
C	Union
D	Minimum 12" above all outlet piping. Installations more than 60" above grade or floor require a permanent platform
E	Provide adequate drainage

Cross-Connection Control Manual**REDUCED PRESSURE PRINCIPLE ASSEMBLY**

Defined

A reduced pressure principle backflow prevention assembly consists of two independently acting internally loaded check valves and a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and below the first check valve. The assembly shall be equipped with two properly located resilient seated test ports, and two resilient seated isolation valves at each end of the assembly.

Installation Requirements

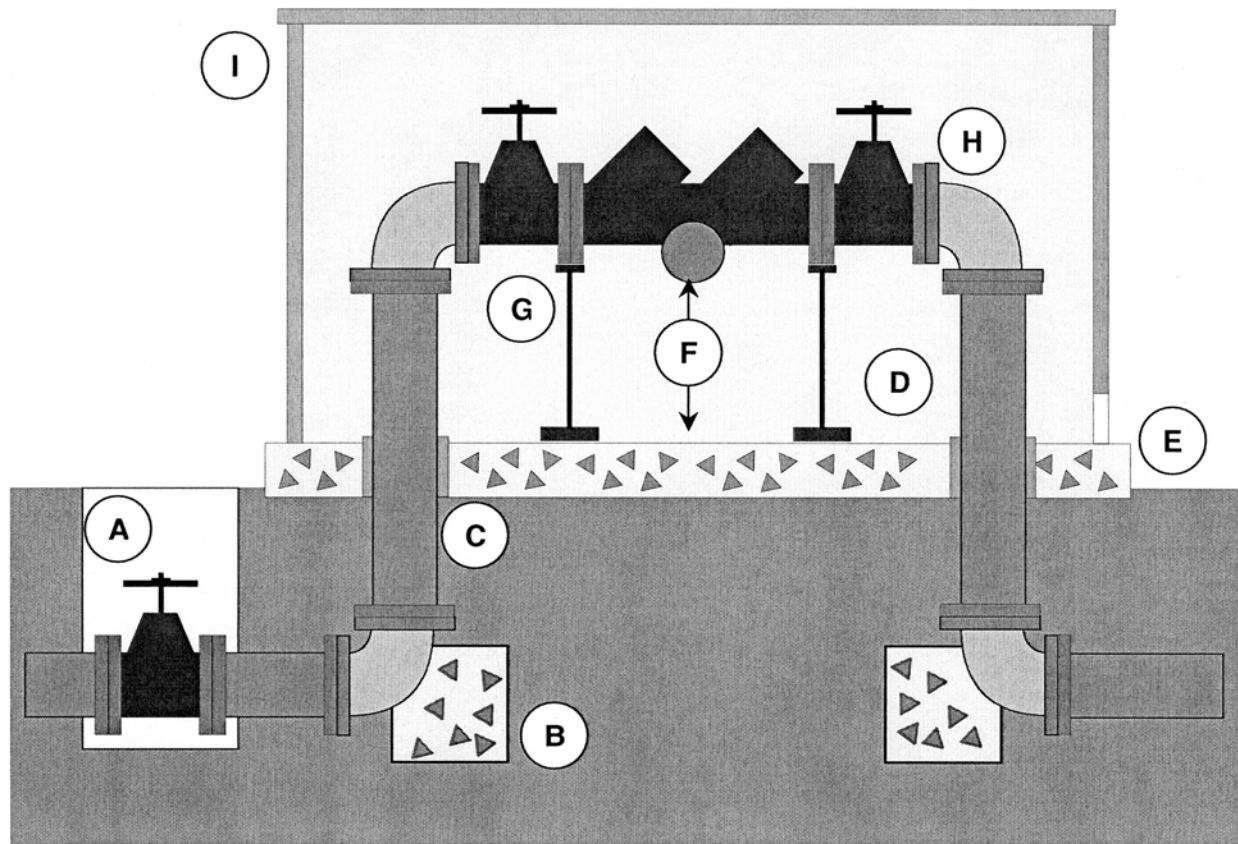
1. The RP must be installed between 12" and 36" above grade from the lowest part of the assembly for containment installations, and between 12" and 60" above floor or grade from the lowest part of the assembly for isolation installations. The assembly shall not be subjected to flooding.
2. Drainage requirements for the RP must be hydraulically calculated to handle the maximum relief valve discharge rate; see "Relief Valve Discharge Rates" chart on page 43. Most manufacturers' air-gap drains are designed to only handle occasional "spitting" from the relief valve and will not accommodate a full discharge. An approved air-gap separation at the relief valve is required.
3. RPs must be installed in locations where intermittent and continuous discharge from the relief valve will not be objectionable.
4. Whenever the RP is insulated, precautions must be taken to prevent blockage of the relief valve opening and access to components. The insulation must be easy to remove in order to facilitate testing and repair.
5. RPs must be installed horizontal and plumb unless specifically noted in the "List of Approved Backflow Prevention Assemblies" published by the FCCCHR.
6. Thermal expansion and/or water hammer in the outlet piping of the assembly can cause excessive pressure. A water hammer arrestor, thermal expansion tank, spring-loaded resilient seated check valve, or surge suppresser installed in the outlet piping is recommended to avoid damage to the piping system and the assembly.
7. Fluctuating inlet pressure may cause intermittent discharge of the relief valve and eventual fouling of the assembly. In a static condition, the zone between the two check valves must be maintained at least 2.0 psi below the supply pressure. A resilient seated check valve installed in the inlet piping of the RP is recommended to maintain constant pressure of the zone during water supply pressure fluctuations.
8. Assemblies 2-1/2" and larger must be adequately supported.
9. Immediately after installation and before the assembly is tested or service is restored, the assembly must be thoroughly flushed. This is accomplished by

Cross-Connection Control Manual**REDUCED PRESSURE PRINCIPLE ASSEMBLY**

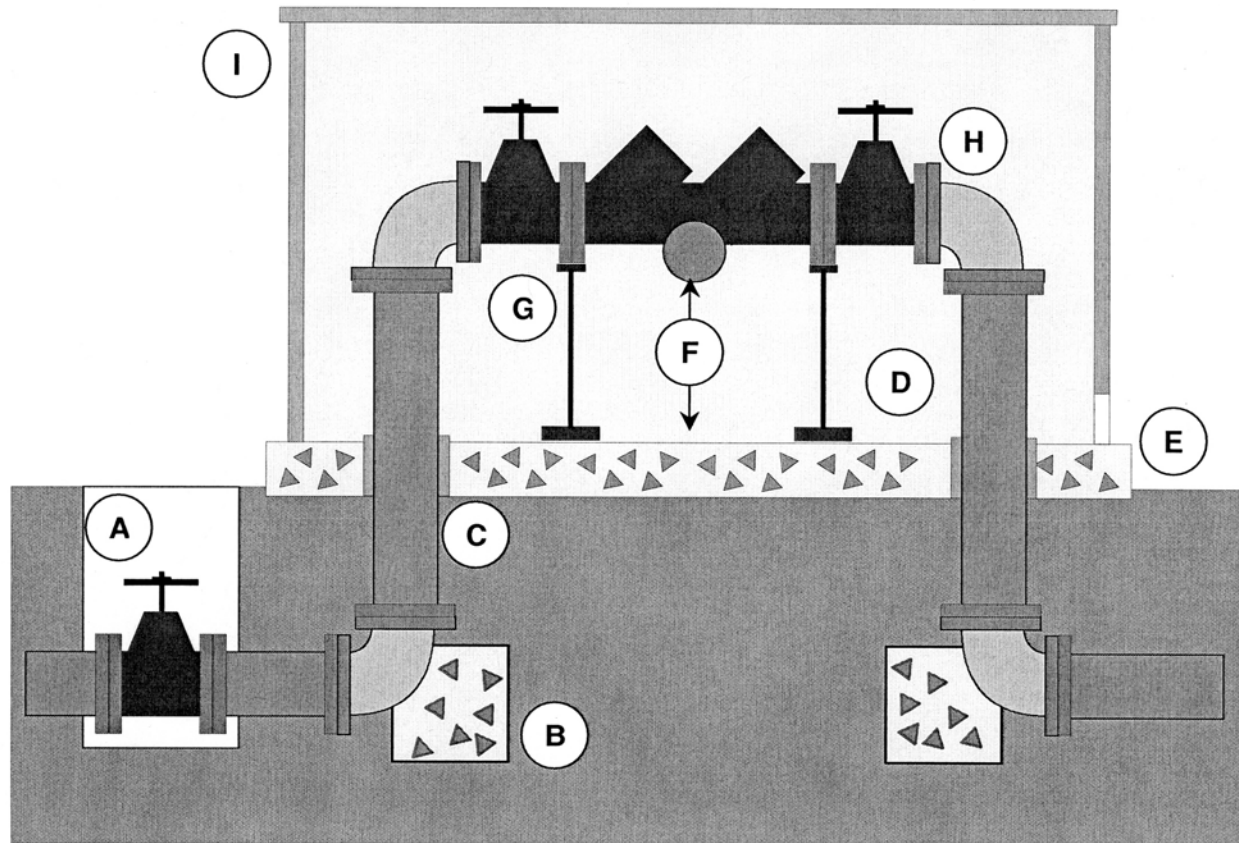
completely removing the No. 1 check valve and opening the No. 1 shut-off valve to flush debris that may foul the assembly.

10. The size of the RP shall not be less than the size of the water supply piping.
11. The RP shall be installed in accordance with the assembly's operating pressure and temperature rating.
12. The RP shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
13. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
14. The RP shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

Cross-Connection Control Manual **REDUCED PRESSURE PRINCIPLE ASSEMBLY**



Indoor Installations	
A	Service line — cement lined ductile iron, copper, or galvanized piping
B	Sleeve with insulation (typical)
C	12" minimum / 60" maximum from lowest part of assembly
D	Metal supports
E	Unions or flanges
F	Provide adequate drainage (see "Relief Valve Discharge Rates" page 43)

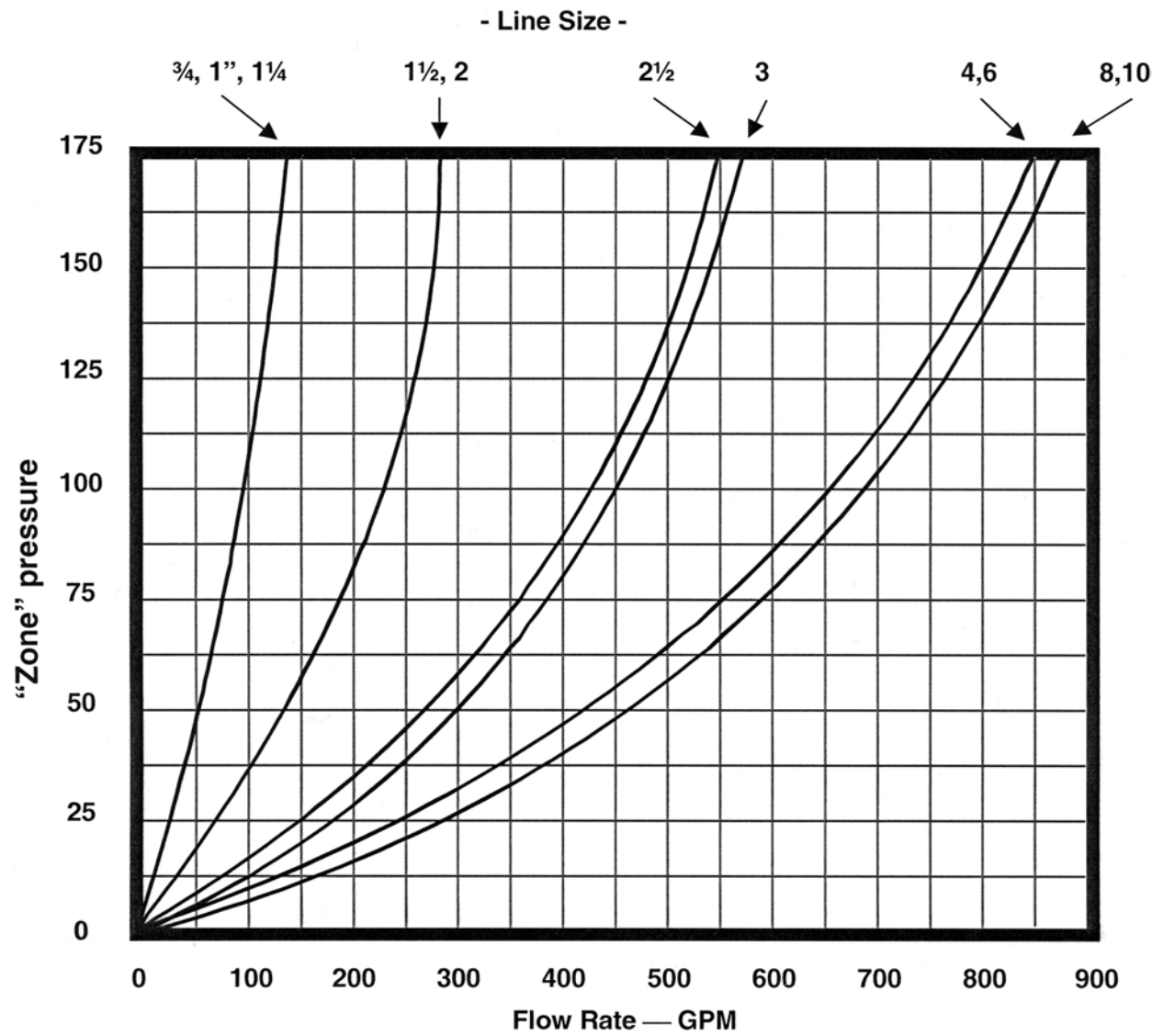
Cross-Connection Control Manual**REDUCED PRESSURE PRINCIPLE ASSEMBLY**

Outdoor Installations	
A	Shutoff valve and valve box
B	Thrust blocking
C	Service line — cement lined ductile iron, copper, or galvanized piping
D	Sleeve with insulation (typical)
E	4" concrete slab (3000 psi, reinforced w/1/2" rebar & 4" mesh, scored)
F	12" minimum / 36" maximum from lowest part of assembly
G	Metal supports on assemblies 2½" and greater (typical)
H	Unions or flanges — above grade (typical)
I	Protective enclosure with drain (see "Relief Valve Discharge Rates" page 43)

Cross-Connection Control Manual

REDUCED PRESSURE PRINCIPLE ASSEMBLY

Relief Valve Discharge Rates



Flow Rate	Drain Size	Flow Rate	Drain Size
55	2	350	5
112	3	450	6
170	4	760	8

Cross-Connection Control Manual**SPILL-RESISTANT PRESSURE VACUUM ASSEMBLY****Defined**

A spill-resistant pressure vacuum breaker assembly consists of an independently operating internally loaded check valve and an independently operating loaded air inlet valve on the discharge side of the check valve. The assembly shall be equipped with one properly located resilient seated test port and vent valve and two resilient seated isolation valves at each end of the assembly.

Installation Requirements

1. The SVB is intended for indoor installations.
2. The installation requirements for the SVB are the same as the requirements for the PVB.

Cross-Connection Control Manual**EDUCATION & TRAINING****Education and Training**

The Cross-Connection Control Program Manager will establish and maintain cross-connection control education and training for Ft Bliss personnel. Continuous education and training of personnel is essential to insure that people involved in every part of the program have current information. Examples of continuous education and training are as follows:

1. Contractor orientation on acceptable new construction practices. This is applicable to all crafts prior to beginning work.
2. Awareness workshops for Ft. Bliss personnel such as engineers, inspectors, designers, janitorial, and all crafts.
3. Manufacturer hands on training on the use of product used at Ft. Bliss.
4. Forty-hour certification courses repeated every three years.
5. Distribution of printed material for building occupants.

Cross-Connection Control Manual**SEVERABILITY / VIOLATIONS****Severability**

If any provision, section, subsection, sentence, clause, or phrase of this manual, or the application of same to a given set of circumstances, is for any reason held to be invalid, the validity of the remaining portions of the manual shall not be affected.

Violations

The following shall be grounds for the discontinuance of water service:

- Removal or bypassing of any backflow prevention method, device, or assembly;
- Falsification of test reports;
- Obtaining water from a fire hydrant in violation of cross-connection control requirements;
- Connecting a fire protection system to a premises potable water system;
- Allowing uncontrolled cross connections to exist; or
- Failure to cooperate in the installation, maintenance, testing or inspection of backflow prevention assemblies as required by this guidance. Water service shall not be restored until such conditions are corrected.

Discontinuance of water service may be immediate, and without written notice, whenever, in the judgment of the Cross-Connection Control Program Manager, such action is necessary to protect the safety of the premises or the purity of the water distribution system.

Cross-Connection Control Manual

APPROVAL

Approved this ____ day of _____, 2001

By _____

Cross-Connection Control Manual**REFERENCES and WORKS CITED**

- 16 Texas Administrative Code, Chapter 65. Administrative Rules of the Texas Department of Licensing and Regulation.
- City of Albuquerque, Cross Connection Prevention and Control Ordinance. Albuquerque. 1995.
- El Paso Water Utilities Public Service Board. Cross-Connection Control Program, Manual of Procedures. El Paso. 1996.
- Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California. Manual of Cross-Connection Control. 9th ed. Los Angeles, 1993.
- International Association of Plumbing and Mechanical Officials. Uniform Plumbing Code. 2000 ed. Walnut, 1999.
- Lower Valley Water District, Cross-Connection Control Program, Manual of Procedures. Socorro. 1999.
- New Mexico Environment Department, Title 20 Environmental Protection, Chapter 7. Wastewater and Water Supply Facilities.
- Texas Administrative Code. Chapter 290, Public Drinking Water.
- Texas Health and Safety Code, Chapter 341. Minimum Standards of Sanitation and Health Protection Measures.

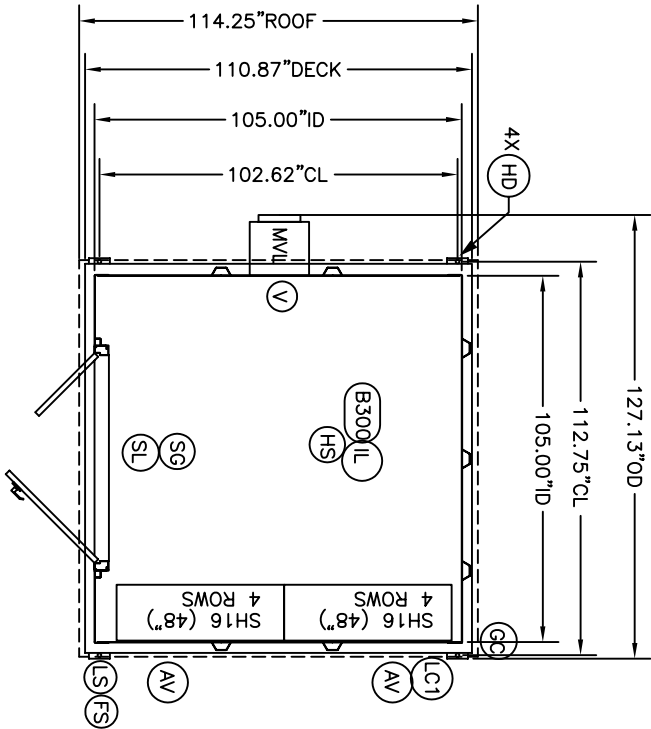
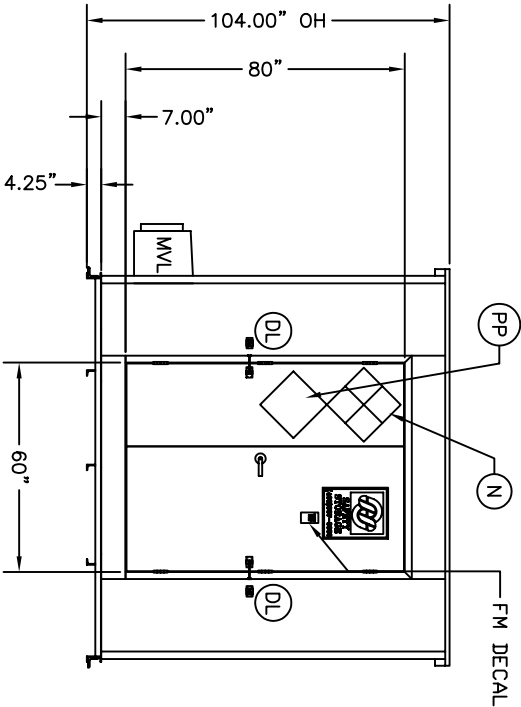
Hazardous Materials Storage Facility

Attached are typical Hazardous Materials Storage Facilities currently used at Ft. Bliss. Inclusion of this information does not preclude the contractor from proposing another type of structure that meets the RFP requirements.

**SAFETY
STORAGE**

2301 BERT LANE
HOLLISTER, CA 95033
PHONE: (408)337-5995
FAX: (408)337-7493

MODEL 1010S



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CUSTOM COLOR
EXTERIOR

- NOTES:
- ONE (1) DOUBLE 60"W x 80"H NR DOOR
 - PAINT SPECIFICATION:
PRIMER COAT- EPOXY (EXTERIOR & INTERIOR)
FINISH COAT- POLYURETHANE (EXTERIOR & INTERIOR)
COLOR- STANDARD WHITE (INTERIOR)
COLOR- CUSTOM TBD (EXTERIOR)
 - TOTAL 16" WIDE ADJUSTABLE STAINLESS STEEL SHELVING = 32'
 - 240/120V, 1 PHASE

LEGEND

- AV: AIR INLET VENT
B3000: LIGHT, 300 WATT LAMP UPGRADE
DL: DOOR LATCH
FS: FAN SWITCH (NON-EXPLOSION PROOF)
GC: GROUNDING CONNECTION
HD: HOLD-DOWN BRACKET
HS: HEAT SENSOR
IL: INTERIOR LIGHT FIXTURE (EXPLOSION PROOF)
LC1: LOAD CENTER
LS: LIGHT SWITCH (NON-EXPLOSION PROOF)
MVL: MECHANICAL VENTILATOR, LOW MOUNT 600 CFM (EXPLOSION PROOF)
N: NFPA 704M RATING SIGN
PP: PERMANENT D.O.T. PLACARD
SG: STEEL FLOOR GRATING (GALVANIZED)
SH16: SHELVING, 16" WITH 1" LIP
SL: SUMP LINER (HDPE)
V: VENT

SIGNATURE

NUMBER: MR-4683
CUSTOMER: FORT BLISS
DATE: 4/27/06 PREPARED BY: HJE
SALES #: PAGE 1 OF 2



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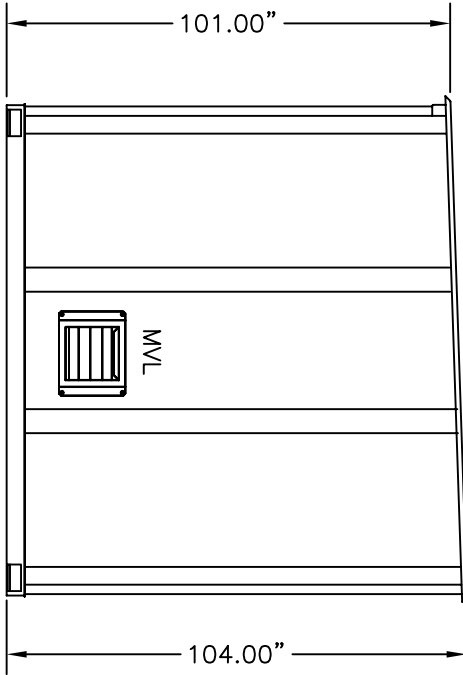
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CUSTOMER: FORT BLISS

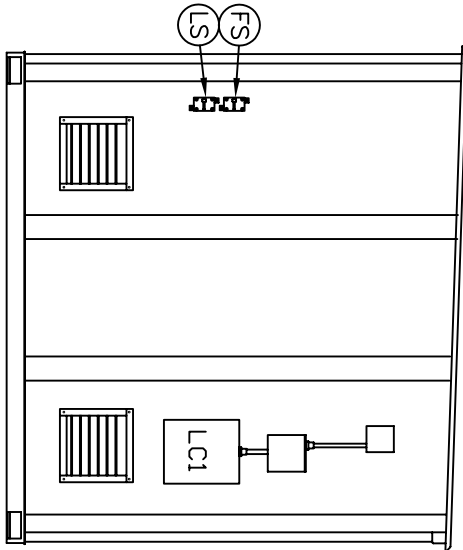
DATE: 4/27/06 PREPARED BY: HJE

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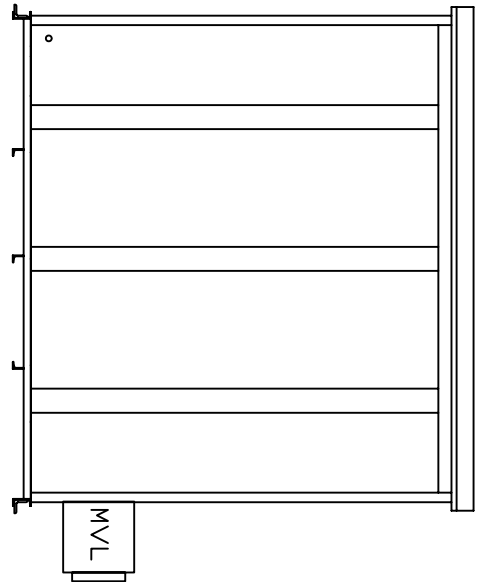
LEFT END VIEW



RIGHT END VIEW



REAR VIEW



CUSTOM COLOR
EXTERIOR

Cage Code 47484		DUNS: 148223068	
Page	Item Number	Quantity	Description: CHEMICAL STORAGE LOCKERS
FN-5	1010S	1	Model 1010 S Nominal Dimensions: (LxWxH): 10' x 10' x 9' Steel Floor Grating with 500 psf uniform load capacity, One (1) Steel Double Door , Two (2) Air Inlet Vents
FN-11	B,24,a	32 Loneal foot	16 inch wide Shelving – stainless steel with 1 inch spill containment lip
FN-11	B,29	100 sq. ft.	Sump Liner
FN-13	D,8,a	1	Explosionproof Electromechanical Exhaust Ventilation System
FN-15	D,17,a	1	Lights – Interior Explosionproof with Non EP Exterior Light Switch
FN-15	D,17,l	1	300w light bulb upgrade
FN-16	D,23,a	1	Load Center
FN-25	M,6,a	1	Custom exterior paint color
FN-13	D,8,l	1	Heat sensor – used for fan shut down

***Please note that the buyer is responsible for off-loading, arming the Fire Suppression System, and installation of the locker.**

DRAWING NO. TR9233



**SAFETY
STORAGE**

2501 WEST ONE
HOLLIST, CA 94033
PHONE (415) 577-4055
FAX (415) 577-7405

MODEL

[REDACTED]

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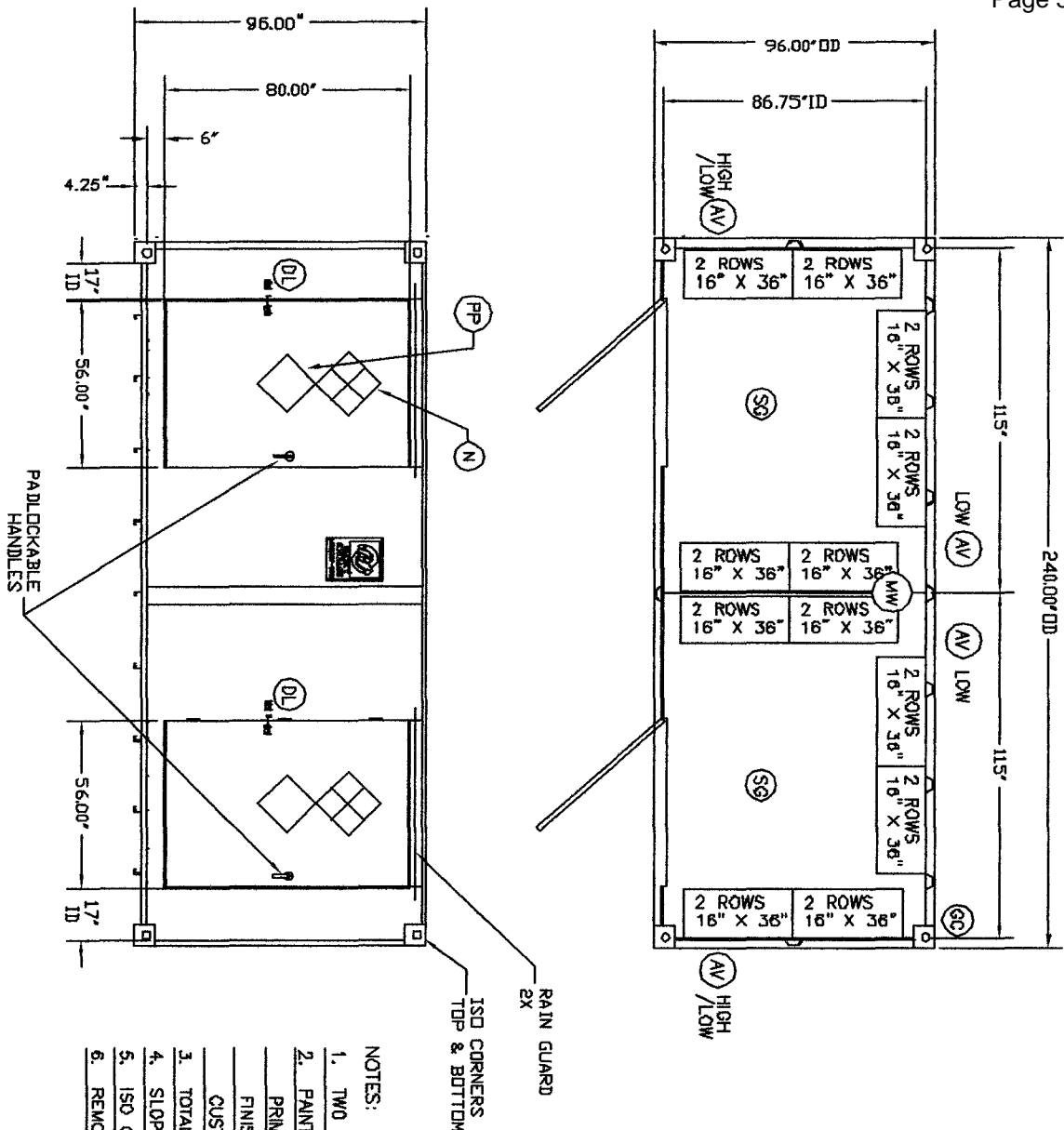
NUMBER:

CUSTOMER: FORT SILL

DATE: 7/24/03 PREPARED BY: HJE

#-SALES

PAGE 1 OF 2



CUSTOM COLOR

LEGEND

AV:	AIR INLET VENT
DL:	DOOR LATCH
GC:	GROUNDING CONNECTION
MW:	FULL HEIGHT METAL WALL
N:	NFPA 704M RATING SIGN
PP:	PERMANENT D.O.T. PLACARD
SG:	STEEL FLOOR GRATING (GALVANIZED)

NOTES:

1. TWO (2) 56"W x 80"H STEEL DOORS
2. PAINT SPECIFICATION:
 - PRIMER COAT-- EPOXY (EXTERIOR & INTERIOR)
 - FINISH COAT-- POLYURETHANE (EXTERIOR & INTERIOR)
 - CUSTOM COLOR-- RT 8205 (EXTERIOR & INTERIOR)
3. TOTAL 18" WIDE ADJUSTABLE STAINLESS STEEL SHELVING = 72
4. SLOPED ROOF (1-1/2") WITH NO OVERHANG
5. ISO CORNERS (TOP & BOTTOM) W/NO HOLD-DOWNS
6. REMOVABLE RAIN GUARDS OVER DOORS

DRAWING NO. TR92332

MODEL

SAFETY STORAGE
120 IN. H. X 96 IN. W. X 12 IN. D.
100% POLYPROPYLENE
100% RECYCLED
100% UV STABILIZED

20150

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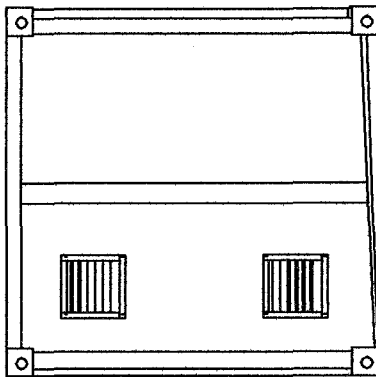
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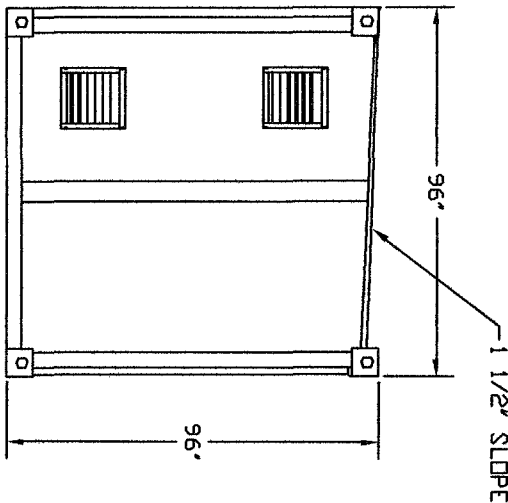
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TR 10975

LEFT END VIEW

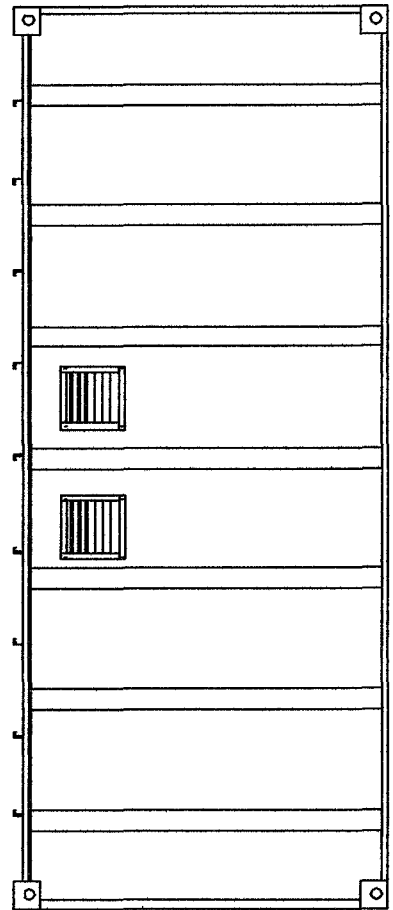


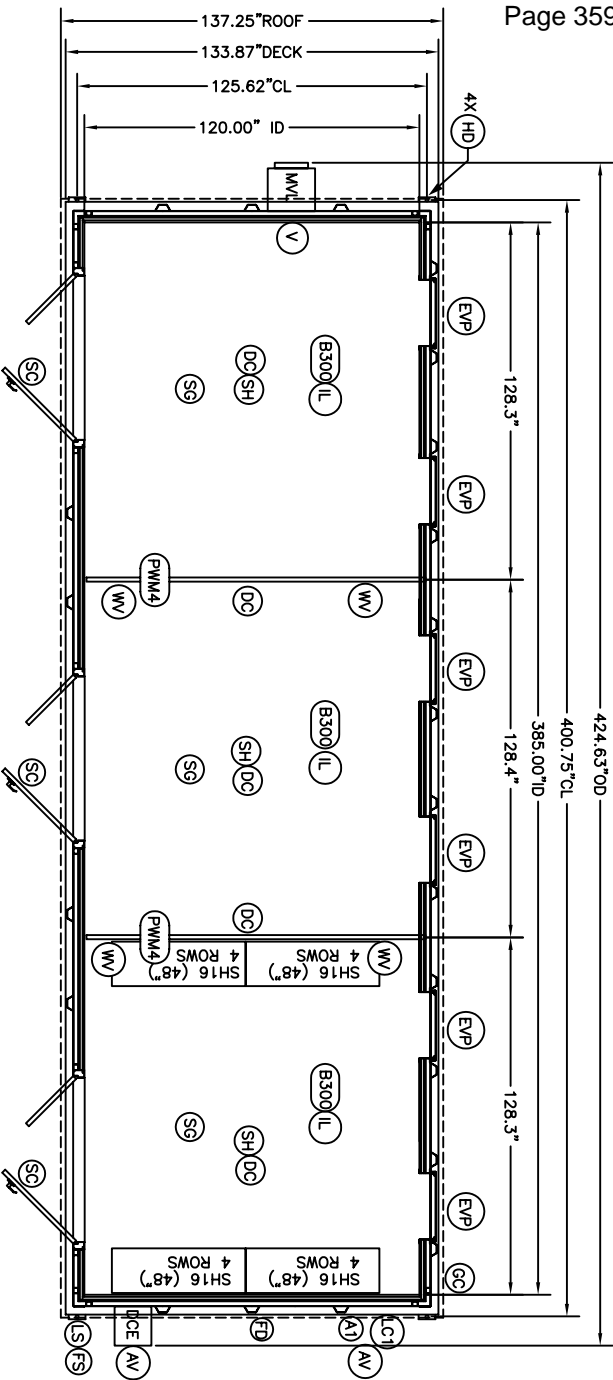
RIGHT END VIEW



CUSTOM COLOR

REAR VIEW





LEGEND

- A1: ALARM FOR DRY-CHEM (NON-EXPLOSION PROOF)
AV: AIR INLET VENT WITH 3 HR FIRE DAMPER
B300: LIGHT, 300 WATT LAMP UPGRADE
DC: DRY CHEM NOZZLE
DCE: DRY CHEM ENCLOSURE W/AGENT CYLINDER
EVP: EXPLOSION VENT PANEL
FD: FIRE DEPT HOOK-UP FOR SPRINKLER (2.5\"/>

Friday, February 19, 2010

CUSTOM COLOR
EXTERIOR

NOTES:

- THREE (3) DOUBLE 60\"/>
- PAINT SPECIFICATION:
PRIMER COAT- EPOXY (EXTERIOR & INTERIOR)
FINISH COAT- POLYURETHANE (EXTERIOR & INTERIOR)
COLOR- STANDARD WHITE (INTERIOR)
COLOR- CUSTOM TBD (EXTERIOR)
3. EVP CONSTRUCTION, 6 PANELS
4. TOTAL 16\"/>

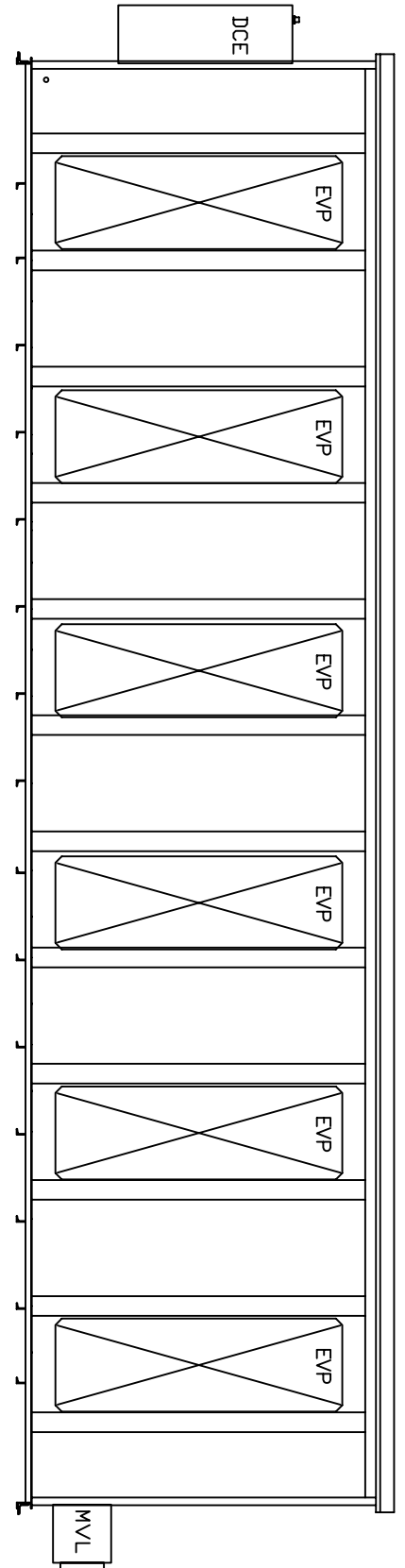
SAFETY STORAGE
3201 BERT LANE
HOLLISTER, CA 95033
PHONE: (408)337-5895
FAX: (408)337-7405
MODEL 3412FSE

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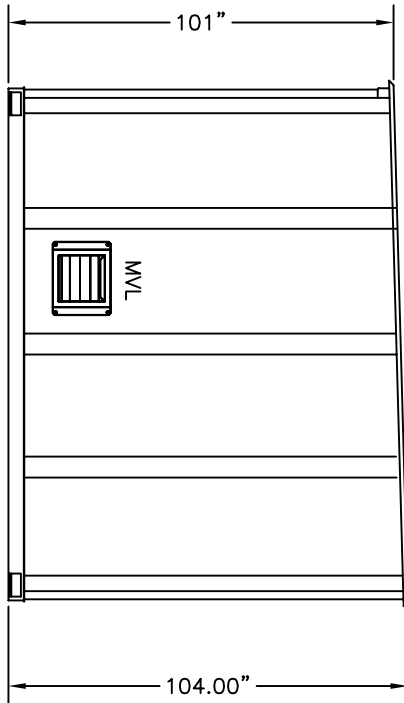
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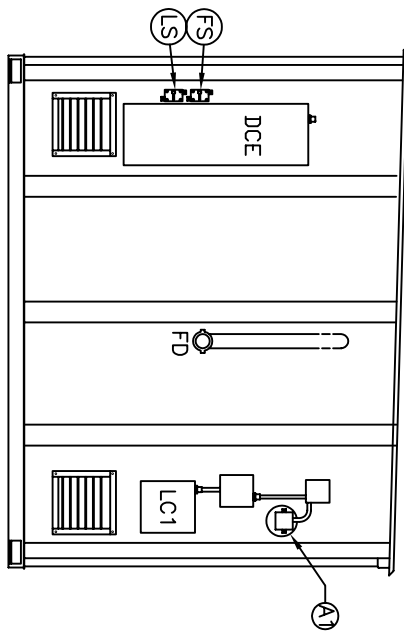


REAR VIEW

CUSTOM COLOR
EXTERIOR



LEFT END VIEW



RIGHT END VIEW

Section: APPENDIX E

SAFETY STORAGE
2301 BERT LANE
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PAGE 2 OF 2

APPENDIX F

CONCEPTUAL AESTHETIC CONSIDERATIONS

**Patriot Battalion Complex (PN 69177)
POL Truck Company UMF (PN 69307)
Area Development Guides**



September 2008
Contract # W9126G-08-D-0001
Fort Bliss, Texas



**US Army Corps
of Engineers®**

JACOBS / HUITT-ZOLLARS

Section:

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Section One: Introduction

1.1 Purpose and Project Scope

The Patriot Battalion Complex and POL Truck Company Unit Maintenance Facility (UMF) Area Development Guide (ADG) outlines an overall development framework, siting parameters, architectural image and character, and utility location guidance for these facilities. The following projects are addressed by this ADG: PN 69177 Patriot Battalion Complex and PN 69307 POL Truck Company Unit Maintenance Facility.

1.2 Organization and Content

This Area Design Guide includes documentation that addresses siting, as well as architectural image and character guidance in the following document components.

Section One: Introduction provides an overall description of the ADG and gives background on purpose, organization, design theme and intended use of the ADG.

Section Two: Patriot Battalion applies the above referenced themes to the Patriot Battalion Complex and addresses the location and layout of utilities serving these facilities.

Section Three: POL Truck Company UMF applies the above referenced themes to the POL Truck Company UMF and addresses the location and layout of utilities serving these facilities.



Figure 1.1 Patriot Battalion Headquarters

1.3 Background

Many real world challenges are associated with the rapid pace of Military Construction Transformation. High among these challenges is how an installation like Fort Bliss can communicate effectively with its design-build contractor partners and establish the high-quality architectural parameters that are so necessary to furthering the military mission without constraining building techniques, materials, or workmanship that are the purview of the contractor. In other words, this issue involves how Fort Bliss can access the best design and construction practices in terms of performance-based criteria, which will make MILCON Transformation the new reality without compromising its mission or the specific implications of community, order, and sense of place that position the installation squarely within the Army's over arching military tradition.

1.4 Audience

The ADG is to be used by firms responding to RFPs for the new product line approach and individuals involved in decision-making, design, construction, and facility maintenance including the following users:

- Department of Public Works (DPW).
- Installation facility planning and design personnel.
- Installation facility maintenance personnel.
- Design-build contractors and consulting planners, architects, engineers, and landscape architects.
- U.S. Army Corps of Engineers project managers, design, construction staff and DPW project managers.

The ultimate success of the ADG is dependent upon the commitment of these individuals and organizations working as a team to apply these standards in a consistent manner.

1.5 Design Theme

The overall design theme for Fort Bliss embraces “A sustainable response to the local environment.” In support of this theme, the architectural style of all buildings shall reflect and reinforce this goal of sustainability for the installation, responding to the intense El Paso sun. Both buildings and sites shall be designed and constructed to incorporate appropriate sustainable strategies, which will reduce energy and maintenance costs in the future through the intelligent application of building forms, details and materials. Each of the facilities fall into various distinct architectural theme areas outlined in the Fort Bliss Installation Design Guide (IDG). The visual image and design of all buildings respond to a “visual hierarchy” that incorporates a range of building design components and El Paso imagery. They are varied in use, but should demonstrate strong relationships to their immediate environment, and should visually tie to each other with a consistent architectural theme established for that area.

The overall architectural theme of Fort Bliss is one of unification, reflecting the architectural heritage of El Paso and the environment in which it is geographically located. The characteristics of the original Fort Bliss style is described as “El Paso Vernacular,” an adaptation of the historical development of European Mediterranean influence in a desert environment. Generally, this



View of the Fort Bliss Main Cantonment Area

style is evidenced by hip/low pitched roofs, deep overhangs, punched window openings, craftsman designed/constructed framing, member detailing, sun-shading devices and column/trellis elements for sun responsiveness and scale. Horizontal banding, reveals, pronounced cornice lines, and a distinct military rhythm are visible components in this style, set against the pristine backdrop of the Franklin Mountain Range. Building colors are also responsive to this environment, taking on the hues and subtlety of indigenous stone, illuminated by the lighting sequence of the sun as it changes throughout the day.

1.6 Design Goals

The overall intent of the ADG is to provide clear, yet comprehensive design standards that establish and also maintain a positive visual image. Overall goals that reinforce this intent include:

- Provide a set of general design standards for design-build contractors that determine color, style, and other aspects of design for all visual elements for new construction.
- Provide structured methods for establishing projects to improve the Cantonment’s visual image.
- Provide standards to design-build contractors and other firms responding to RFPs for each product line.

Design goals that will inform the development of the architectural image and character concept, include the following:

- Provide architectural design standards in the form of visual, functional, and thematic

design imagery to communicate the design intent, image, and character.

- Promote visual continuity while accommodating varying program requirements with design standards that will support strong and consistent design cohesiveness.
- Integrate sustainable design and planning principles to minimize adverse environmental effects and maximize the use of local and regional resources and products.

1.7 Design Objectives

Design objectives that reinforce overall design goals include:

- Enhance the quality of experience for soldiers and civilian personnel .
- Conform to Anti-Terrorism/Force Protection (AT/FP) standards.
- Create a sense of place with a desirable, recognizable identity.
- Provide visual and functional variety.
- Design in flexibility for potential future uses.
- Design for good environmental stewardship.
- Reference local climate, materials, and building traditions.
- Promote energy conservation.
- Incorporate sustainable features.
- Emphasize a pedestrian-friendly, campus-like environment.

Section Two: Patriot Battalion

2.1 Patriot Battalion

The Patriot Battalion Complex is divided into two discrete clusters. Because of their spatial separation, the Headquarters (HQ) and Company Operations Facility (COF) will be addressed separately from the Technical Equipment Maintenance Facility (TEMF) and Deployment Storage.

2.2 Facility Siting

The proposed Patriot Battalion HQ and COF are located on the main cantonment at the intersection of Jeb Stuart Road and Haan Avenue. The HQ and Patriot Battalion COF are to be sited to reinforce a relationship within the development framework of the existing installation. The buildings address the street, holding a presence on the site with the HQ main entry facing Haan Avenue.

The proposed Patriot Battalion TEMF and Deployment Storage facilities are located just down the road at the intersection of Stennis Street and Carrington Road. Taking maximum advantage of this excellent location, the specific siting of these buildings reinforces the urban street network by pulling the building up to a consistent setback with other structures along Stennis Street.

The TEMF should express a strong sense of relationship to adjacent facilities across the street and within this general installation area. This facility will also be related to the POL Truck Company Operations Facility (COF) and set up a relationship in siting placement, form, and material usage.

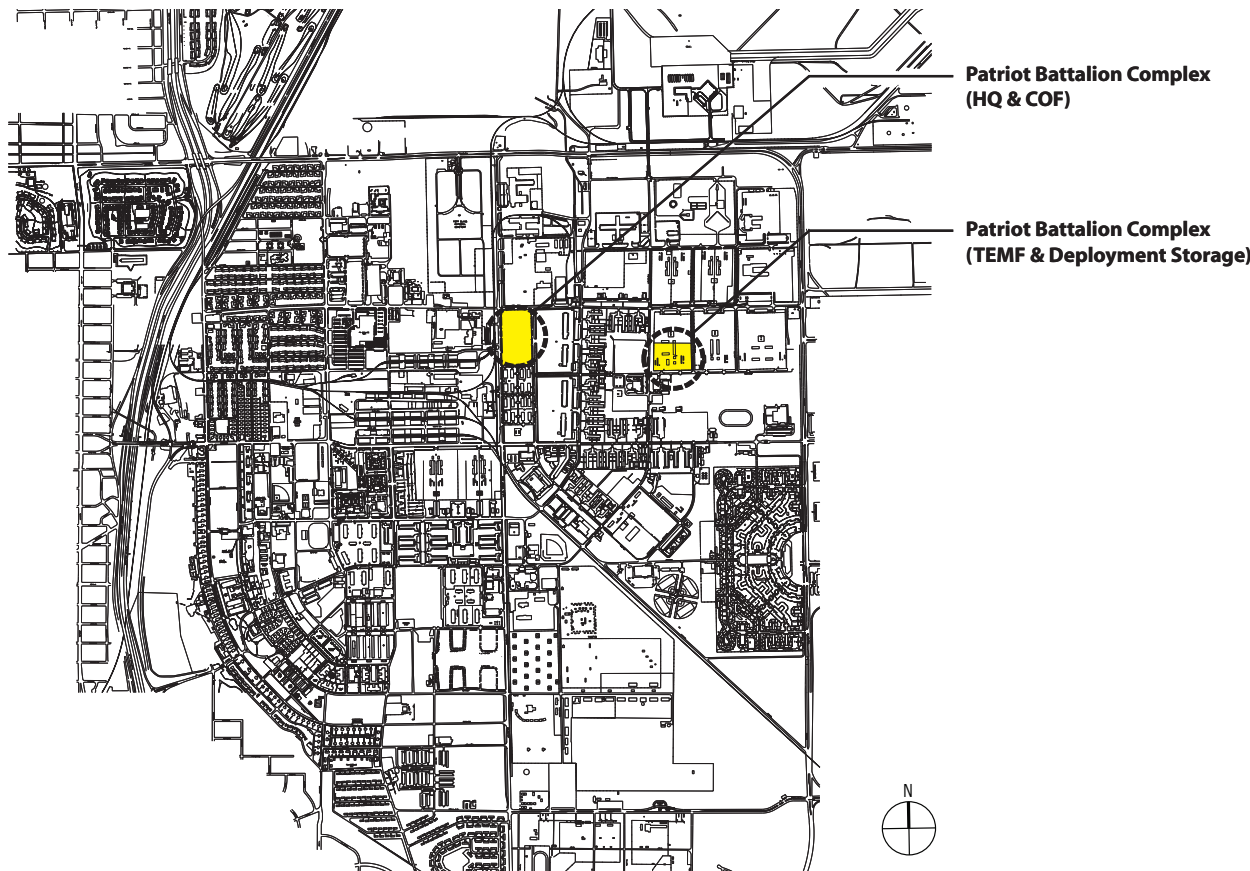


Figure 2.1 Patriot Battalion Vicinity Map

2.3 Architectural Context

It is important that these buildings be designed to fit within a compatible visual framework, also recognizing benefits derived from a similarity of building design imagery. The visual image and design of the buildings comprising the complex respond to a “visual hierarchy” that incorporates a range of building design images. As one of the most visually important and monumental structures, the proposed Headquarters (HQ) building is reinforced by other facilities that collectively contribute to the overall visual image and design character of the area.

Table 2.1 lists all of the building types that make up the complex and also references the section in the document for specific design guidance. Each respective facility section describes the required architectural image and features for each building type.

The buildings that make up the the complex shall follow the architectural style and design vocabulary outlined in the corresponding narratives, which have been specifically developed, tested, and selected as appropriate.

Table 2.1 Patriot Battalion Facilities Types

Building Types	Page
Battalion Headquarters (HQ)	2.3
Company Operations Facility (COF)	2.5
Tactical Equipment Maintenance Facility (TEMF)	2.7
Deployment Storage	2.9

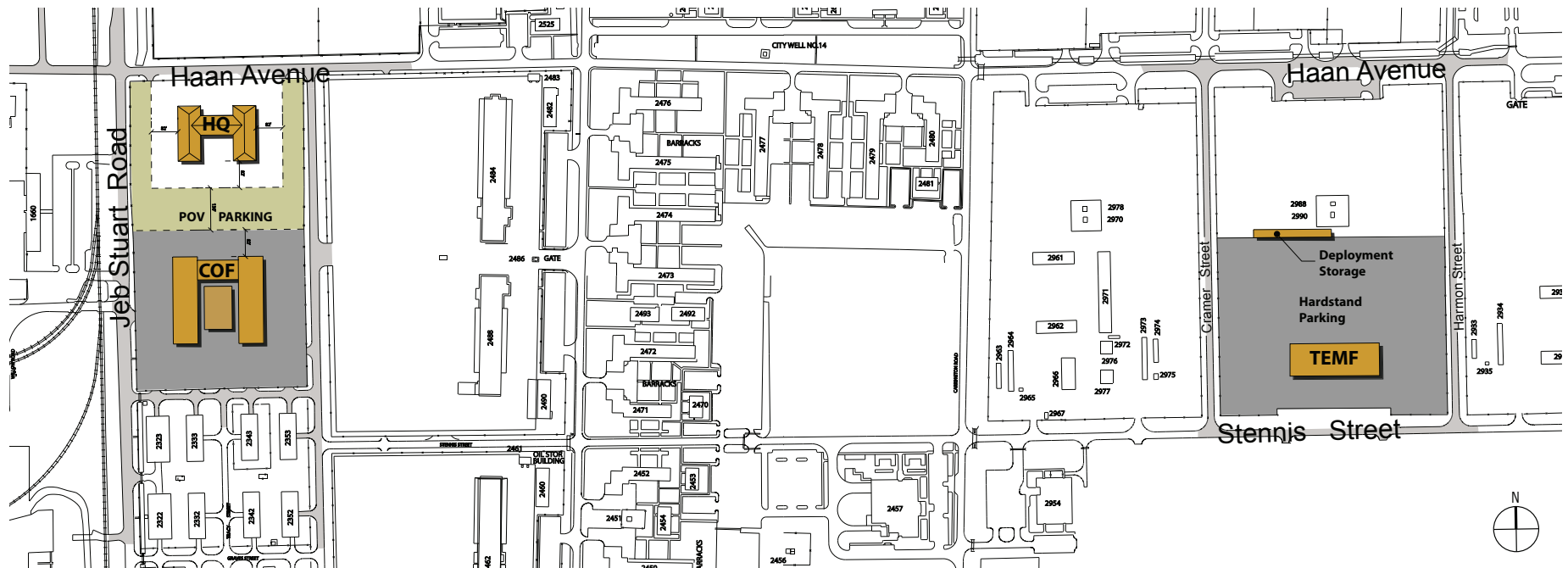


Figure 2.2 Patriot Battalion Site Map

2.4 Headquarters

As the most architecturally significant building within the complex, the character of the Battalion Headquarters (HQ) should express formality and professionalism. HQ facilities should be designed to reflect the Battalion's importance and strength, while unifying the complex with architectural elements and enhancing the context of the setting.

Massing

While the HQ building should inherently be an imposing structure, its design needs to address pedestrians at entries by being sensitive to human scale in its massing. The large volume of three-

story space should have appropriate architectural components and proportion, incorporating design detail in materials, reveals, banding, patterns, and wall textures. Accent bands define the horizontal stratification of the building's floors and bracket window lines.

Form

The form of HQ buildings should relate to the street network, other community facilities, and work centers in a way that unifies the district architecturally, while providing appropriate and convenient access. A vertical element will create visual interest near the entry and will contrast with the horizontal elements of the

front elevation. The central mass of the building should be set back from the vertical element and the lateral wings, creating an entry courtyard for the facility.

Roof Style

Use a visually flat roof behind a parapet wall over all building volumes, with the parapet forming an accent band at the top of each wall. The parapet should be designed to conceal mechanical systems located on the roof. The roof of the central tower mass should rise over the central mass of the building, and step down to the roof over the lateral wings of the building.

Wall Base

Use a base of split-face CMU, sized appropriately to the building volume in order to form a significant element.

Entry Canopy

Use a simple, visually flat canopy at the entry for sun shading and to also create an entry statement. Support the entry canopy on columns that are architecturally related to the building.

Colonnade

Mark the entry by supporting the canopy on columns that are architecturally related to the building, providing shade, shadow, and visual articulation to the building exterior. The colonnade also serves as a further link to the district's architectural theme.

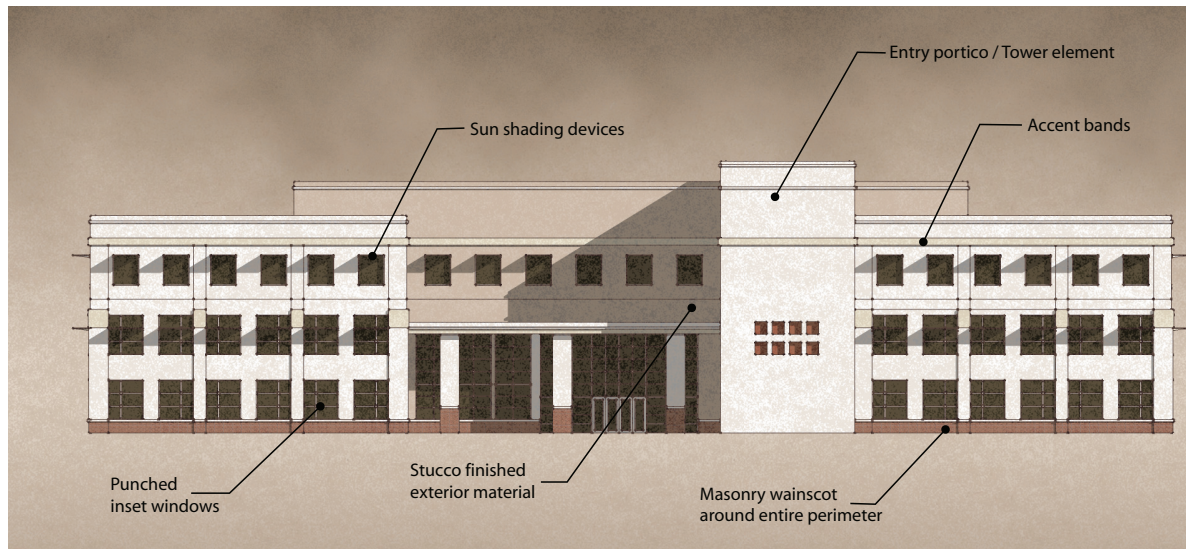


Figure 2.3 Patriot Battalion Headquarters

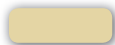
Exterior Building Signage

The standards to apply for exterior building signage font, color, sizing, and material is found in U.S. Army Technical Manual (TM) 5-807-10. Exterior building signage must be visible from all approaching streets to the facility. The location, design, and fabrication of exterior building signage must be reviewed with and approved by Fort Bliss Department of Public Works (DPW) prior to installation.

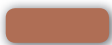
Color and Material Palette

Use pale, neutral colors as the principal wall colors. Select an accent color or colors on building elements, such as on parapets, parapet caps, column caps, etc., as visual "punctuation." Vary materials, colors, or textures to distinguish building masses and forms.

- Wall Base: Split-face CMU.
- Walls: Stucco-finish.
- Windows and Frames: Optimize LEED energy efficient design requirements. Glazing and Frames to be brown in color.
- Miscellaneous Metals: Match the adjacent wall color.
- Select an accent color, or colors, on building elements.



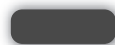
Wall



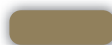
Color Banding



Roof



Frames/ Trim



Glazing



Base

Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.



Figure 2.4 Conceptual Patriot Battalion HQ Floor-Plan

Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.



Figure 2.5 Patriot Battalion Headquarters

2.5 Company Operations Facility

As an administrative facility, the Company Operations Facility (COF) should have an attractive appearance that reflects the importance of company administration and operations.

Massing

The massing of the COF is horizontal, with lateral wings framing an offset central mass. The central mass of the building is accented by windows and an arcaded portico, which communicates its entry function.

Entry designs should address pedestrians by being sensitive to human scale in its massing. The facility should have appropriate architectural components and proportion, incorporating design detail in materials, reveals, banding, patterns, and wall textures.

Form

Building form should relate to the street network, other community facilities, and work centers in a way that unifies the district architecturally, while providing appropriate and convenient access. Large building volumes should feature functional decoration, including sunshades and offset stairwells, where they are required.

Roof Style

Use a visually flat roof behind a parapet wall over all building volumes, with the parapet forming an accent band at the top of each wall. The parapet should be designed to conceal mechanical systems located on the roof. The roof of all building volumes should be of uniform height.

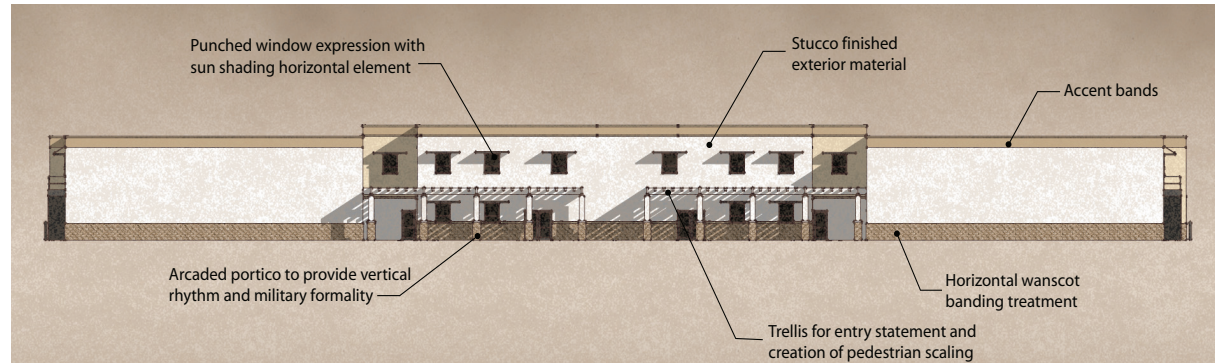


Figure 2.6 Patriot Battalion COF

Wall Treatment

Use blank, asymmetrical massing, and punched fenestration on the central administration facade. Introduce shadow lines and building massing by recessing or bringing forward building planes, spandrels, and window openings. Walls should have an appearance of depth rather than appearing to be a flush, thin "skin." Use more than one principal wall color to accentuate and articulate the building's form; provide and differentiate cornices, columns, spandrels, and banding.

Wall Base

Use a base of split-face CMU sized appropriately to the building volume to form a natural "grounding" element.

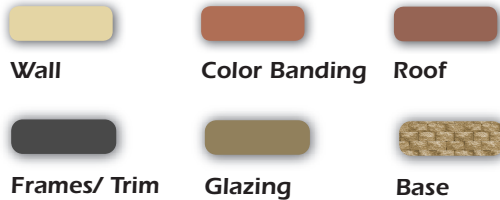
Trellises

Trellises provide shade and sun protection at the entry, while also adding architectural interest with articulation and shadow added to the building's exterior.

Color and Material Palette

Use pale neutrals as the principal wall colors to match the surrounding structures. Select an accent color, or colors, on building elements such as parapets, parapet caps, and column caps as visual “punctuation.” Vary materials, colors, or textures to distinguish building masses and forms.

- Wall Base: Split-face CMU.
- Walls: Stucco finish.
- Roof: Low slope (flat), light in color.
- Windows and Frames: Optimize LEED energy efficient design requirements. Glazing and Frames to be brown in color.
- Miscellaneous Metals: Match the adjacent wall color.



Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.

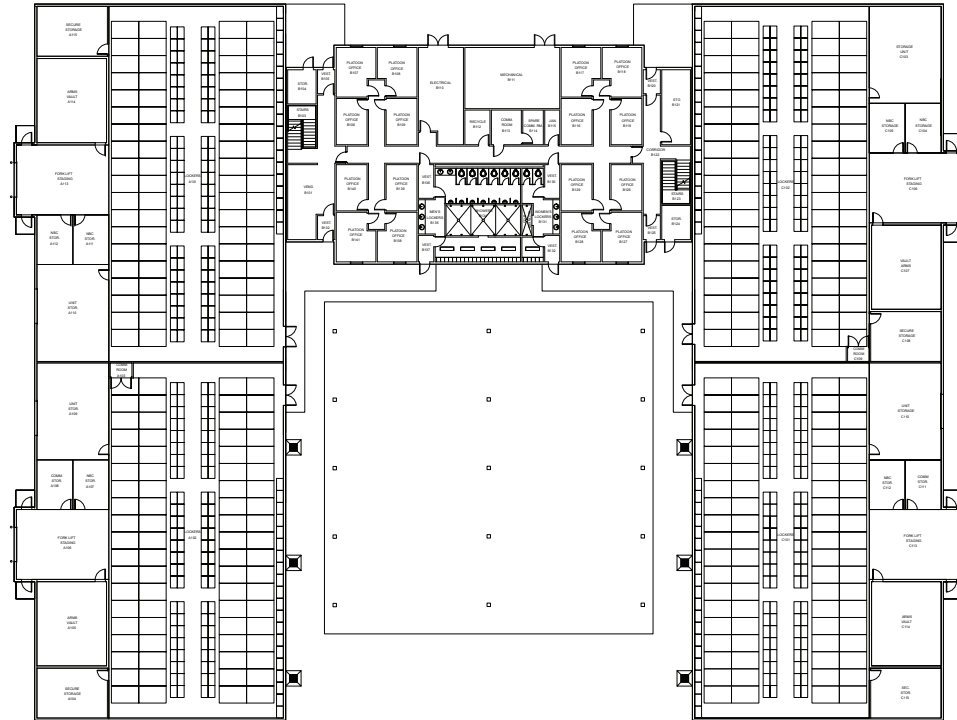


Figure 2.7 Conceptual Patriot Battalion COF Floor-plan

Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.

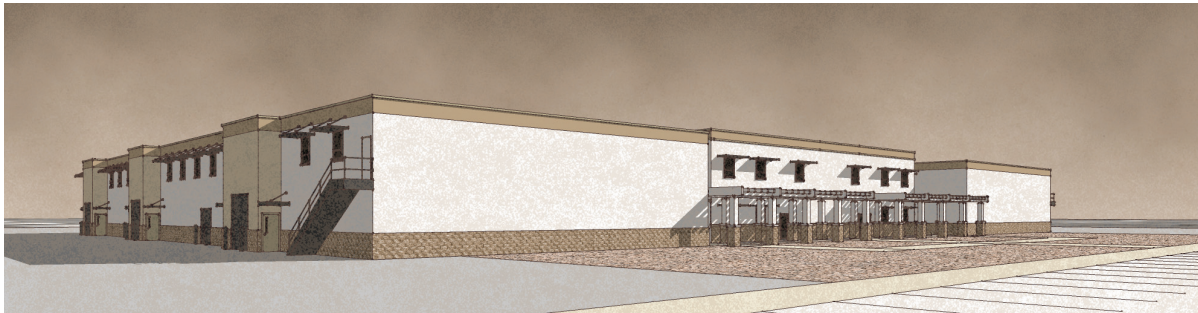


Figure 2.8 Patriot Battalion Company Operations Facility

2.6 Tactical Equipment Maintenance Facility

Tactical Equipment Maintenance Facility (TEMF) should have an appearance that reflects the orderly process of equipment maintenance and an overall industrial character. Architectural consistency and relationship to neighboring facilities lends a unified image to the district.

Massing

The TEMF is a long, high-bay structure with a large footprint and two-story volumes. The administration portion of the facility is a one-story area scaled to appropriate pedestrian scale, utilizing architectural elements, materials, color, and articulation to match the rhythm and cadence of surrounding structures, such as USASMA, as well as historic installation structures. A tower structure marks the main entrance to the facility and reflects the El Paso style of Architecture.

Form

Building form should relate to the operational/military vehicle parking while being functionally responsive to service aprons for ease of use and maneuverability of vehicles. The administration area generally relates to neighboring structures having a more formal architectural image and detailing.

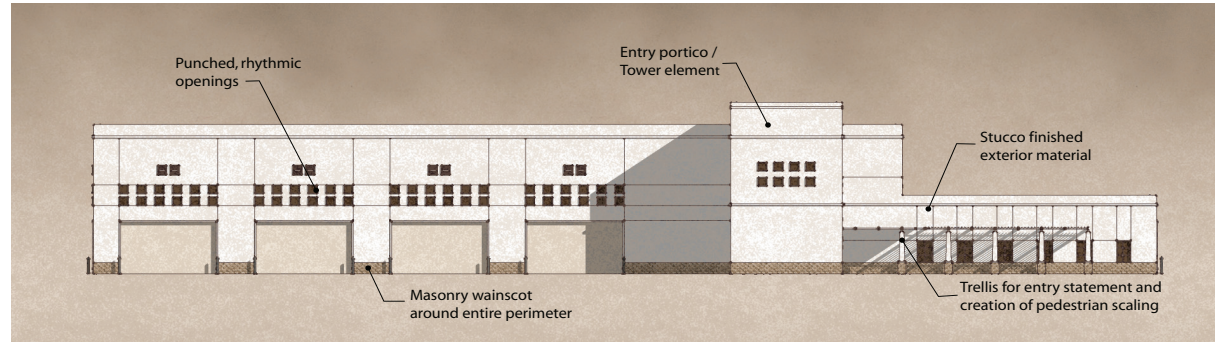


Figure 2.9 Patriot Battalion TEMF

Roof Style

A flat membrane roof behind a parapet wall should shelter the TEMF, including the administration portion of the facility. The parapet should be sufficient to conceal the roof and any mechanical equipment located there. A covered walkway approaching the entry door provides sun-shading and pedestrian scale.

Wall Treatment

Use a formal massing and fenestration. Consistent punched openings provide exterior interest, shadow, and sun-shading in scale to the metal-skinned structure, articulating the exterior walls. Punched openings should be designed to relate directly to the exterior design rhythm of the overhead doors that service the work bays.

Wall Base

The base should be split-face CMU. The entry tower will also have split-face CMU of appropriate scale. Size the base/wainscot with sensitivity to the building volume to form a significant element.

Colonnade

Mark the entry by supporting the canopy on columns that are architecturally related to the theme of the district, providing shade, shadow, and visual articulation to the building exterior. The colonnade also serves as a further link to the overall district architectural theme.

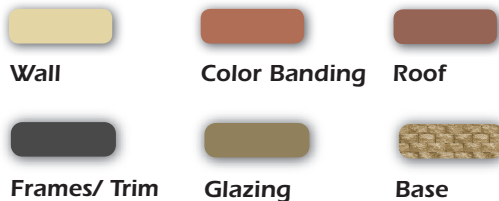
Exterior Building Signage

The standards to apply for exterior building signage font, color, sizing, and material is found in U.S. Army Technical Manual (TM) 5-807-10. Exterior building signage must be visible from all approaching streets to the facility. The location, design, and fabrication of exterior building signage must be reviewed with and approved by Fort Bliss Department of Public Works (DPW) prior to installation.

Color and Materials Palette

Use warm, neutral colors as the principal wall colors. Select an accent color, or colors, on building elements such as parapets, parapet caps, column caps, etc., as visual “punctuation.” Vary materials, colors, or textures to distinguish building masses and forms.

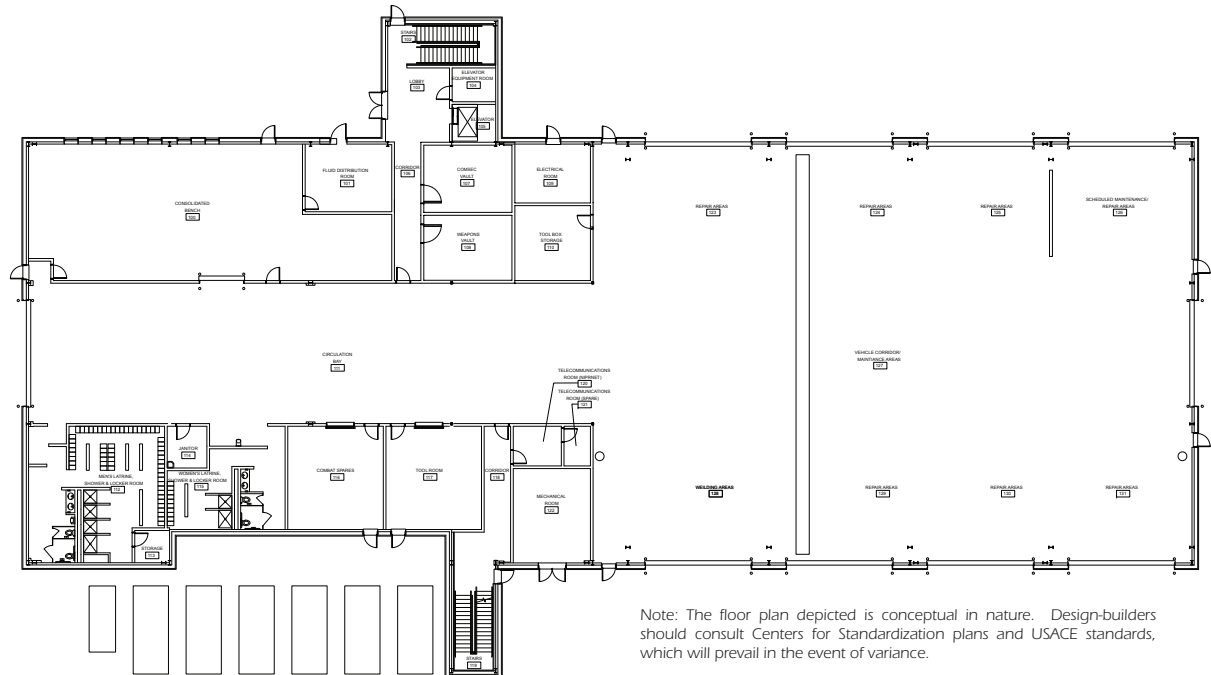
- Wall Base: Split-face CMU.
- Walls: Stucco-finish.
- Roof: Low slope (flat), light in color.
- Windows and Frames: Optimize LEED energy efficient design requirements. Glazing and Frames to be brown in color.
- Miscellaneous Metals: Match the adjacent wall color.



Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.



Figure 2.10 Patriot Battalion TEMF Front Detail



Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.

Figure 2.11 Conceptual Patriot Battalion TEMF Floor-plan

2.7 Deployment Storage

The deployment storage facility should achieve a secure, industrial appearance appropriate to its function. Although a pre-engineered building is ideal, the design should be sensitive to preserving the overall theme of the district.

Massing

Deployment storage is typically characterized by large, long, high-bay structures with large footprints and two-story volumes.

Form

Building form should relate to the maintenance facilities, while being functionally responsive to service aprons for ease of use and maneuverability of vehicles and equipment.

Roof Style

A sloped, metal roof should cover Deployment Storage.

Wall Treatment

Wall treatment shall be pre-finished metal panels, consistent with the TEMF.

Wall Base

Use a base of appropriately scaled split-faced CMU to “ground” the building.

Color and Material Palette

Use pale neutral colors as the principal wall colors. Select an accent color, or colors, on building elements such as parapets, parapet caps, and column caps as visual “punctuation.” The roof color may also be used as an accent color. Vary materials, colors, or textures to distinguish building masses and forms.

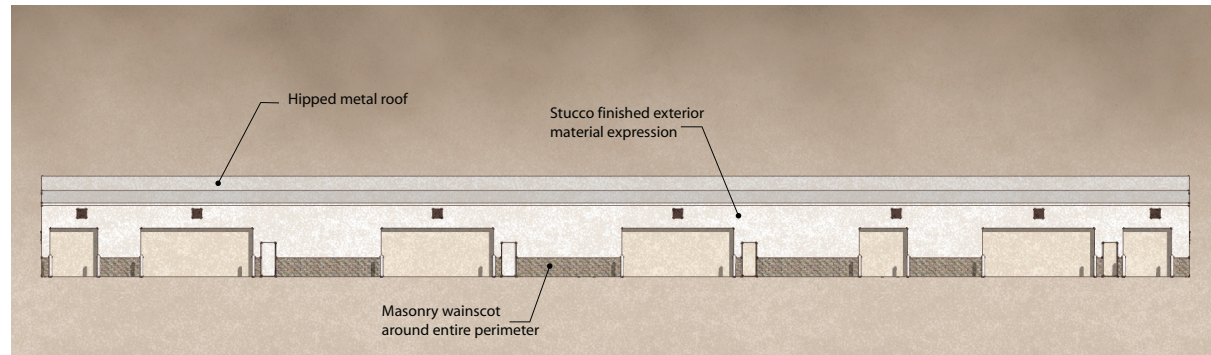


Figure 2.12 Patriot Battalion Deployment Storage

- Wall Base: Split-face CMU
- Walls: Stucco-finish metal panels
- Roof: Metal, light in color
- Windows and Frames: Optimize LEED energy efficient design requirements. Glazing and Frames to be brown in color
- Miscellaneous Metals: Match the adjacent wall color



Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.

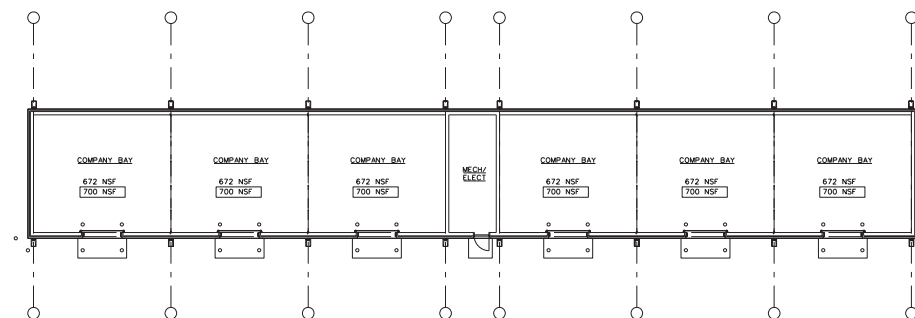


Figure 2.13 Conceptual Patriot Battalion Deployment Storage Floor-Plan

Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.

2.8 Utilities

Utility systems (water, sanitary sewer, electricity, gas, and communications) provide the basic infrastructure necessary for the operation of the Development. Utility system distribution lines will generally follow the roadway corridors. The conceptual/schematic utility routing maps portrayed in Figures 2.14 and 2.15 are based on preliminary design assumptions and are subject to change. In the event that other data is provided in design-build RFP documentation, that information shall govern.

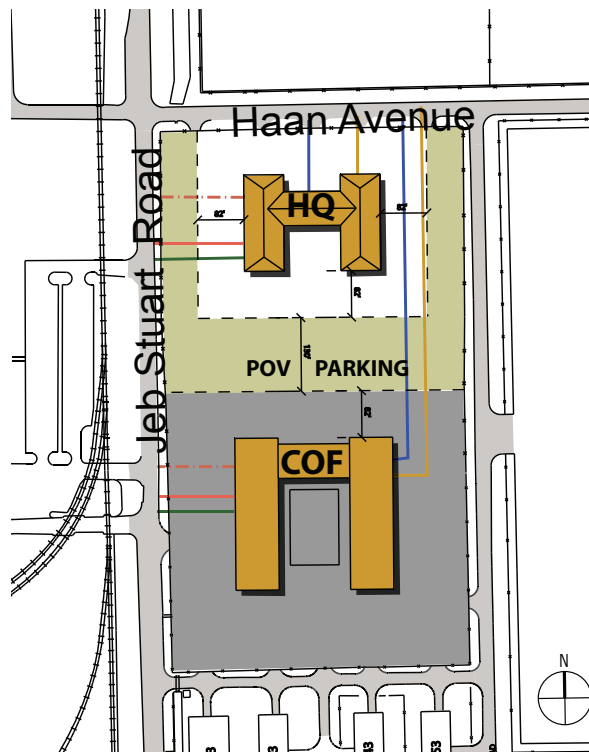


Figure 2.14 Patriot Battalion HQ & COF Utilities

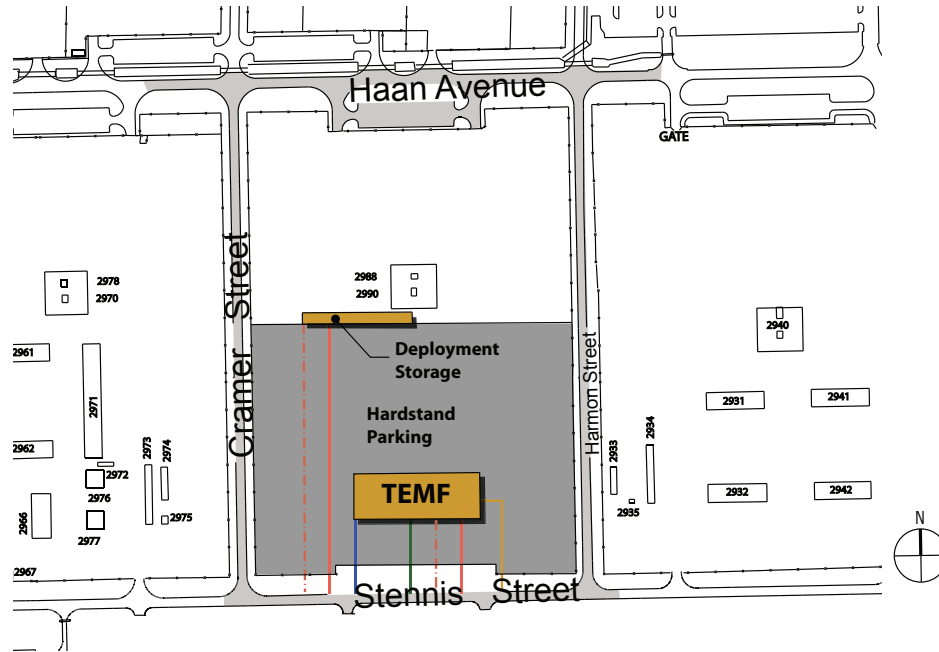


Figure 2.15 Patriot Battalion TEMF & Deployment Storage Utilities

- Overhead Electric
- Underground Electric
- - - Natural Gas
- Water
- Sanitary Sewer
- Communication Duct Bank
- Communications Manhole

Section:

Section Three: POL Truck Company UMF

3.1 POL Truck Company UMF

The POL Truck Company Unit Maintenance Facility (UMF) includes a Company Operations Facility (COF), a Tactical Equipment Maintenance Facility (TEMF) and a Deployment Storage facility.

3.2 Facility Siting

A physical siting relationship exists between the Company Operations Facility (COF) and the Tactical Equipment Maintenance Facility (TEMF). To this end, it is recommended these structures be sited to develop a physical relationship with the massing of the adjacent Engineering Clearance Company Ops complex, which has also been sited and designed to address the surrounding area. The orientation of the building's entrance toward Carrington Road indicates its presence on the site.

Taking maximum advantage of this excellent location, the specific siting of this complex of buildings reinforces the urban street network by pulling the building up to a consistent setback with other structures along Carrington Road.

The Tactical Equipment Maintenance Facility (TEMF) should express a strong sense of relationship to the COF. It should further reflect a sense of unity and place with adjacent facilities such as the Engineering Clearance Company Ops Building in regards to its relationship of siting placement, form, and material usage.

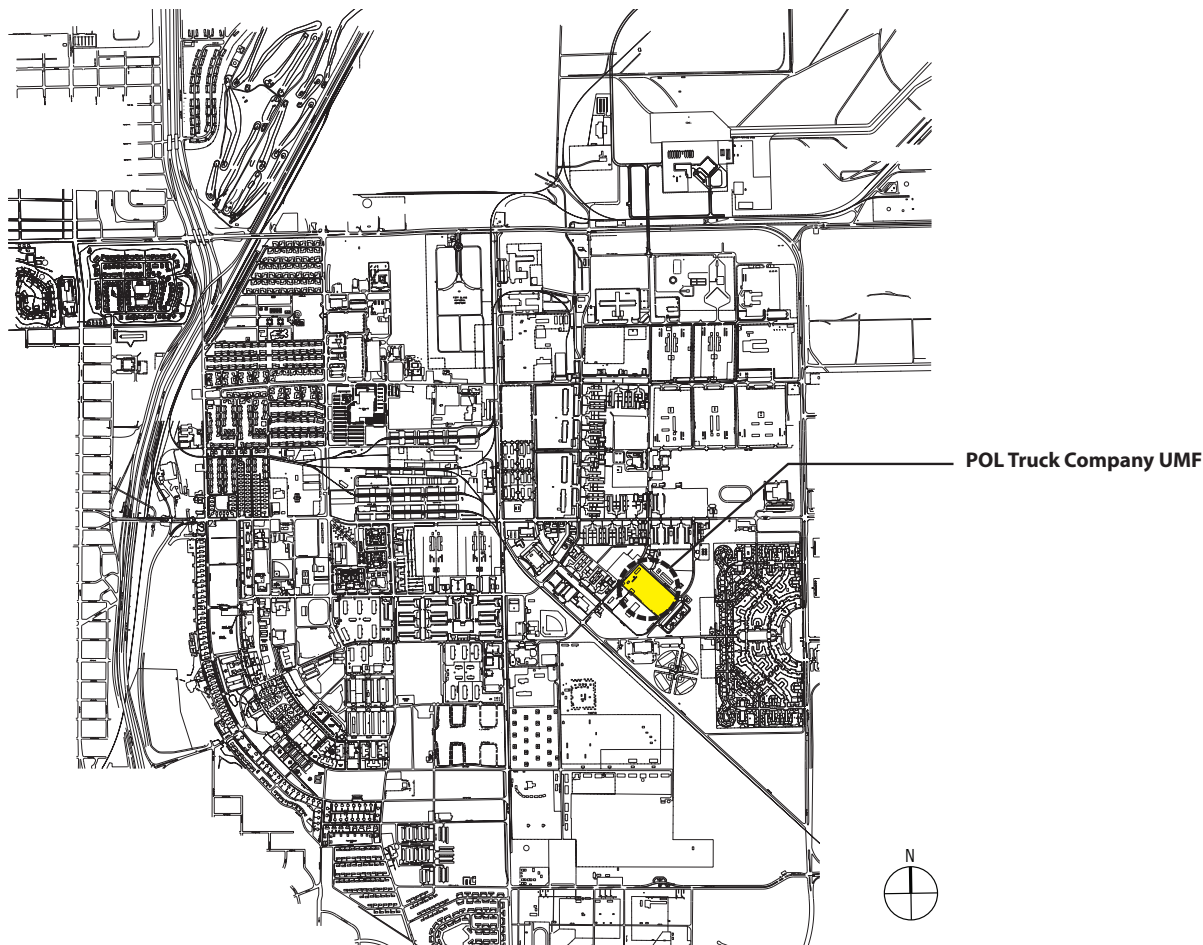


Figure 3.1 POL Truck Company Vicinity Map

3.3 Architectural Themes

It is important that these buildings be designed to fit within a compatible visual framework, also recognizing benefits derived from a similarity of building design imagery. The visual image and design of the buildings comprising the POL Truck Company respond to a “visual hierarchy” that incorporates a range of building design images. The COF and TEMF should reflect the importance of company operations and reinforce other facilities that collectively contribute to the overall visual image and design character of the POL Truck Company area. Table 3.1 lists all of the building types that make up the POL area and also references the section in the document for specific design guidance. Each respective facility section describes in detail the required architectural image and features for each building type.

The buildings that make up the POL Truck Company shall follow the architectural style and design vocabulary outlined in the corresponding narratives, which have been specifically developed, tested, and selected as appropriate.

Table 3.1 POL Trucking Facility Types

Building Types	Page
Company Operations Facility (COF)	3.3
Tactical Equipment Maintenance Facility (TEMF)	3.5
Deployment Storage	3.7

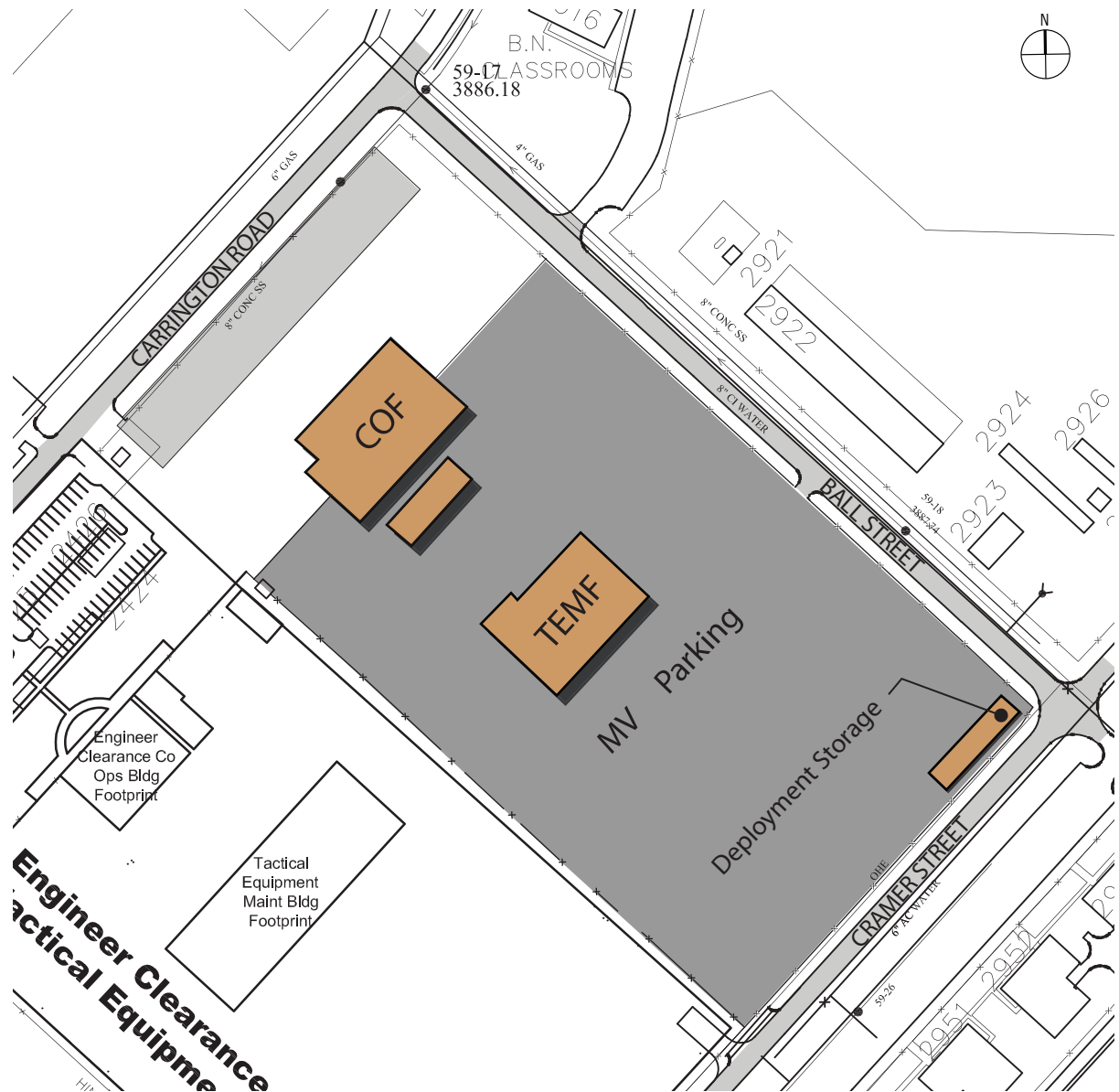


Figure 3.2 POL Truck Company UMF Site Plan

3.4 Company Operations Facility

As an administrative facility, the Company Operations Facility (COF) should have an attractive appearance that reflects the importance of company administration and operations.

Massing

Entry designs need to address pedestrians by being sensitive to human scale in its massing. The facility should have appropriate architectural components and proportion, incorporating design detail in materials, reveals, banding, patterns, and wall textures.

Form

Building form should relate to the street network, other community facilities and work centers in a way that unifies the district architecturally, while providing appropriate and convenient access. A higher central building area marks the entry, articulated with glazing for transparency and light in the interior.

Roof Style

Use a sloped, hipped, low-pitch, metal roof over the primary building volume, with eave overhangs projecting at least five feet for enhanced shade and shadow. Recessed banding at the roof line provides additional scale and detail. Beyond the primary building volume, use a visually flat roof behind a parapet wall and avoid conflicting roof forms and a cluttered appearance. Scale the height of the roof appropriately to the size of the building providing “human scale” design elements.

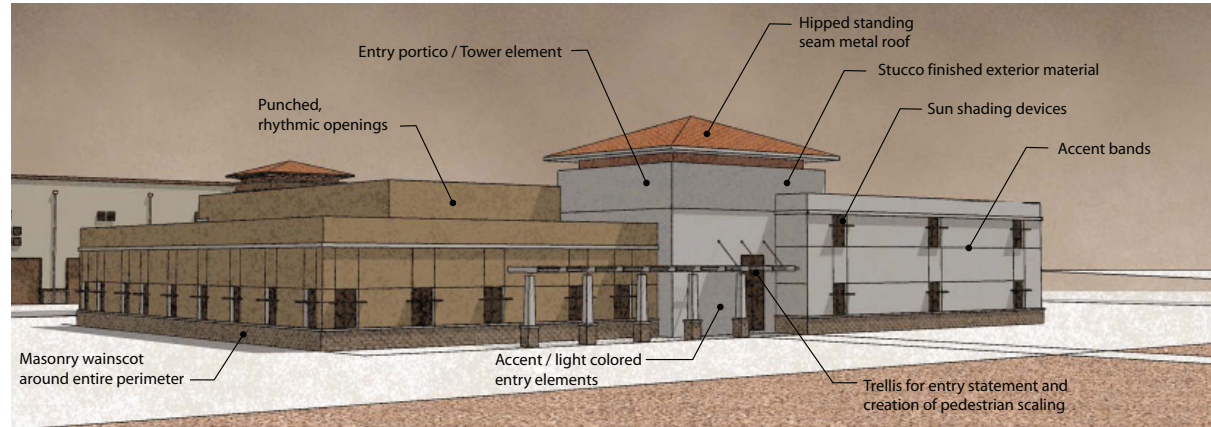


Figure 3.3 POL Company Operations Facility

Wall Treatment

Use a formal, symmetrical massing, and punched fenestration on the administration facade. Introduce shadow lines and building massing by recessing or bringing forward building planes, spandrels, and window openings. Walls should have an appearance of depth rather than appearing to be a flush, thin “skin.” Use more than one principal wall color to accentuate and articulate the building’s form. Provide and differentiate cornices, columns, spandrels, and banding. Use a clerestory in the rear building areas to introduce light to the interior spaces.

Wall Base

The base should be split-face CMU. Size the base/ wainscot with sensitivity to the building volume to form a significant element.

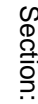
Trellises

Trellises provide shade and sun protection at the entry while also adding architectural interest with articulation and shadow added to the building’s exterior.

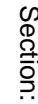
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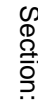


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3.5 Tactical Equipment Maintenance Facility

The Tactical Equipment Maintenance Facility (TEMF) should have an appearance that reflects the orderly process of equipment maintenance and an overall industrial character. Architectural consistency and relationship to neighboring COF facilities lends a unified image to the district. The TEMF should relate to surrounding facilities in terms of design style and architectural finishes.

Massing

The TEMF is a long, high-bay structure with a large footprint and two-story volumes. The design of the TEMF requires an architectural relationship to the COF in particular, due to their proximity. The administration portion of the facility is a one-story area scaled to appropriate pedestrian scale, utilizing architectural elements, materials, color, and articulation to match the rhythm and cadence of the COF, USASMA, and historic installation structures. A tower structure marks the main entrance to the facility and reflects the unifying thematic elements of the district.

Form

Building form should relate to the operational/military vehicle parking while being functionally responsive to service aprons for ease of use and maneuverability of vehicles. The administration area relates to the COF and the neighboring structures having a more formal architectural image and detailing.

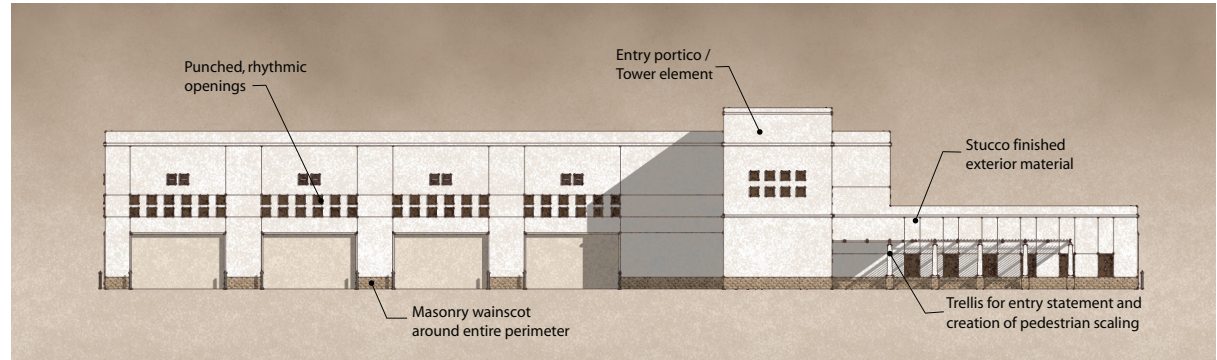


Figure 3.6 POL Tactical Equipment Maintenance Facility

Roof Style

A flat membrane roof should cover the TEMF, including the administration portion of the facility. The elevated roof provided at the main entry tower punctuates its location and ties into the architectural theme of the district, while adding a formal element to an otherwise industrial-style building. A covered walkway approaching the entry door provides sun-shading.

Wall Treatment

Use a formal, symmetrical massing, and fenestration. Consistent punched openings provide exterior interest, shadow, and sun-shading in scale to the metal-skinned structure, articulating the exterior walls. Punched openings should be designed to relate directly to the exterior design rhythm of the overhead doors that service the work bays.

Wall Base

The base should be metal, but designed as separate wainscot treatment with a horizontal metal channel. This metal will be a contrasting color to the main field color of the exterior walls. The entry tower will have a brown brick base of appropriate scale. Size the base/wainscot with sensitivity to the building volume to form a significant element.

Colonnade

Mark the entry by supporting the canopy on columns that are architecturally related to the theme of the district, providing shade, shadow, and visual articulation to the building exterior. The colonnade also serves as a further link to the overall district architectural theme.

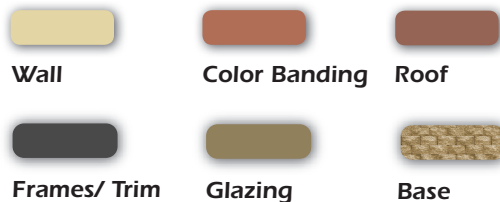
Exterior Building Signage

The standards to apply for exterior building signage font, color, sizing, and material is found in U.S. Army Technical Manual (TM) 5-807-10. Exterior building signage must be visible from all approaching streets to the facility. The location, design, and fabrication of exterior building signage must be reviewed with and approved by Fort Bliss Department of Public Works (DPW) prior to installation.

Color and Materials Palette

Use warm, neutral colors as the principal wall colors. Select an accent color, or colors, on building elements such as parapets, parapet caps, column caps, etc. as visual "punctuation." The roof color may also be used as an accent color. Vary materials, colors, or textures to distinguish building masses and forms.

- Wall Base: Split-face CMU
- Walls: Stucco-finish
- Roof: Metal, Terra Cotta in color
- Windows and Frames: Optimize LEED energy efficient design requirements / Glazing and Frames to be brown in color
- Miscellaneous Metals: Match the adjacent wall color



Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.

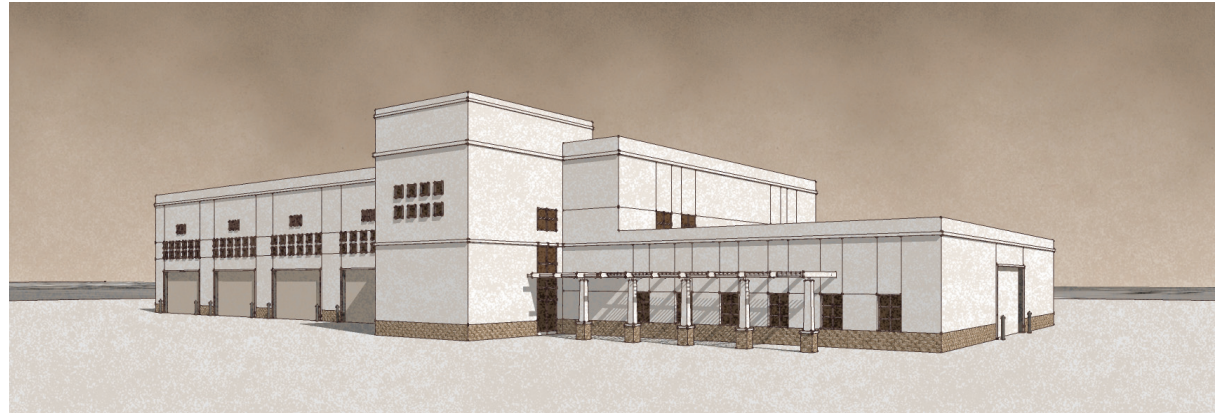
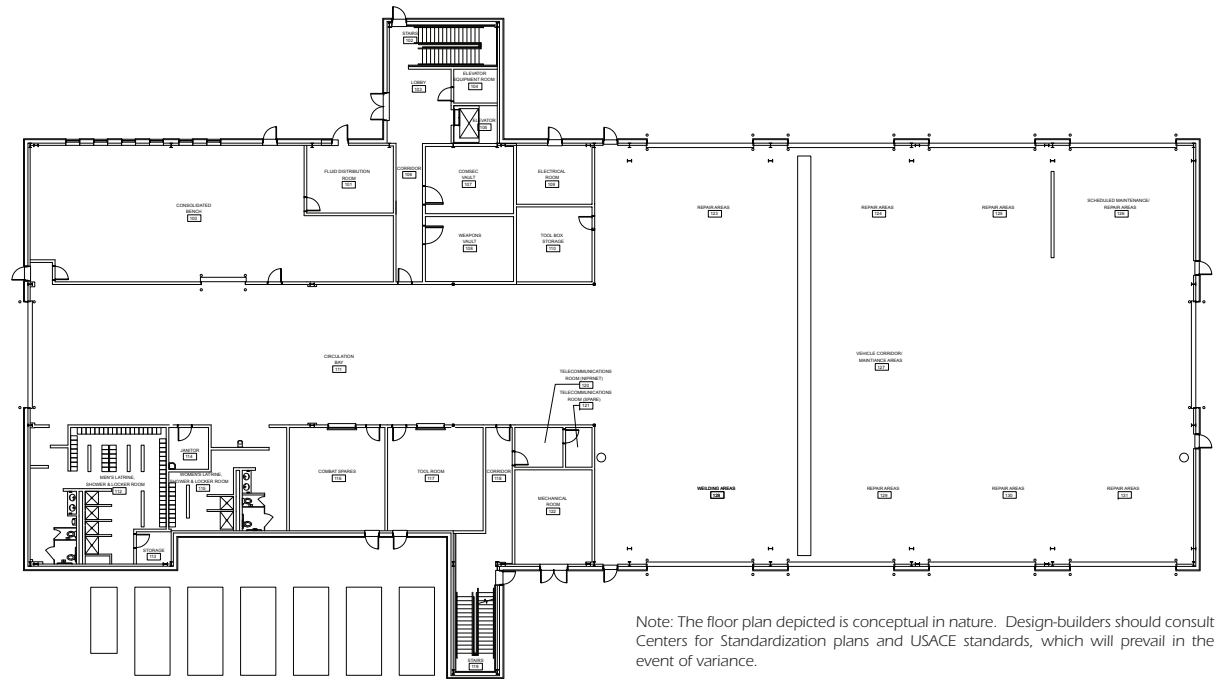


Figure 3.7 POL Tactical Maintenance Facility



Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.

Figure 3.8 Conceptual POL TEMF Floor-plan

3.6 Deployment Storage

The deployment storage facility should achieve a secure, industrial appearance appropriate to its function. Although a pre-engineered building is ideal, the design should be sensitive to preserving the overall theme of the district.

Massing

Deployment storage is typically characterized by large, long, high-bay structures with large footprints and two-story volumes.

Form

Building form should relate to the maintenance facilities, while being functionally responsive to service aprons for ease of use and maneuverability of vehicles and equipment.

Roof Style

A sloped, metal roof should cover Deployment Storage.

Wall Treatment

Wall treatment shall be pre-finished metal panels, consistent with the TEMF.

Wall Base

Use a base of appropriately scaled split-faced CMU to “ground” the building.

Color and Materials Palette

Use pale neutral colors as the principal wall colors. Select an accent color, or colors, on building elements such as parapets, parapet caps, and column caps as visual “punctuation.” The roof color may also be used as an accent color. Vary materials, colors, or textures to distinguish building masses and forms.

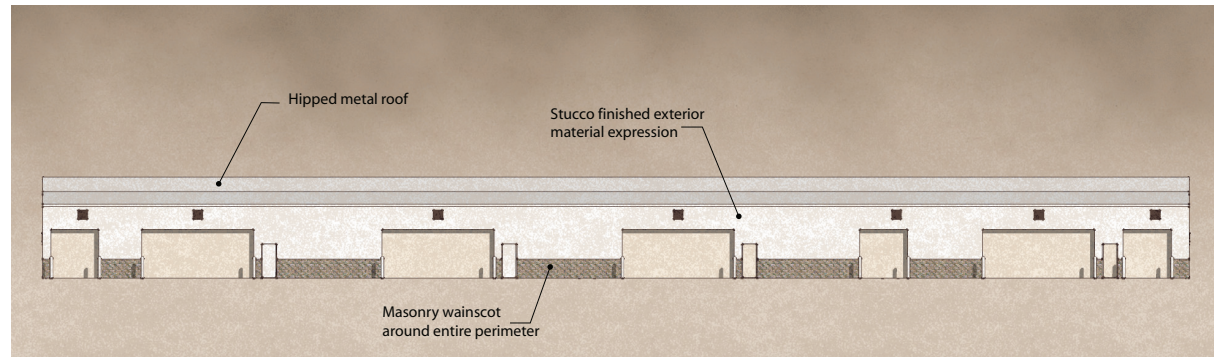
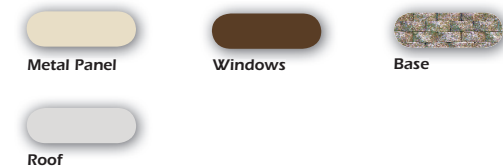
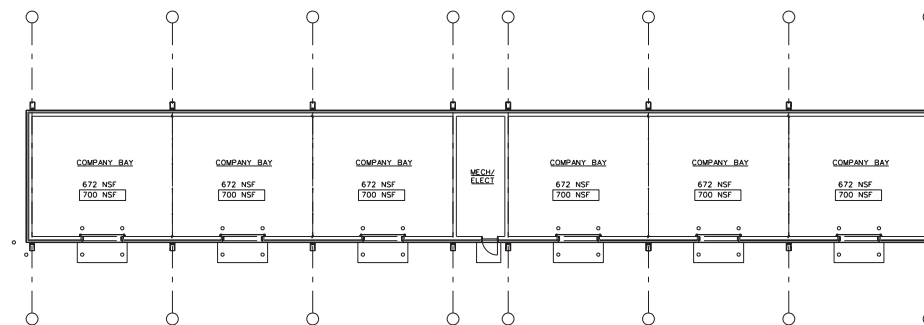


Figure 3.9 POL Deployment Storage Facility

- Wall Base: Split-face CMU.
- Walls: Stucco-finish metal panels.
- Roof: Metal, Terra Cotta in color.
- Windows and Frames: Optimize LEED energy efficient design requirements/ Glazing and Frames to be brown in color.
- Miscellaneous Metals: Match the adjacent wall color.



Note: Colors depicted are approximate and may vary with color printing method. The final color selection is subject to review and approval of the DPW architect.



Note: The floor plan depicted is conceptual in nature. Design-builders should consult Centers for Standardization plans and USACE standards, which will prevail in the event of variance.

Figure 3.10 Conceptual POL Deployment Storage Floor-Plan

3.7 Utilities

Utility systems (water, sanitary sewer, electricity, gas, and communications) provide the basic infrastructure necessary for the operation of the Development. Utility system distribution lines will generally follow the roadway corridors. The conceptual/schematic utility routing maps portrayed in Figure 3.11 are based on preliminary design assumptions and are subject to change. In the event that other data is provided in design-build RFP documentation, that information shall govern.

- Overhead Electric
- Underground Electric
- - - Natural Gas
- Water
- Sanitary Sewer
- Communication Duct Bank
- Communications Manhole

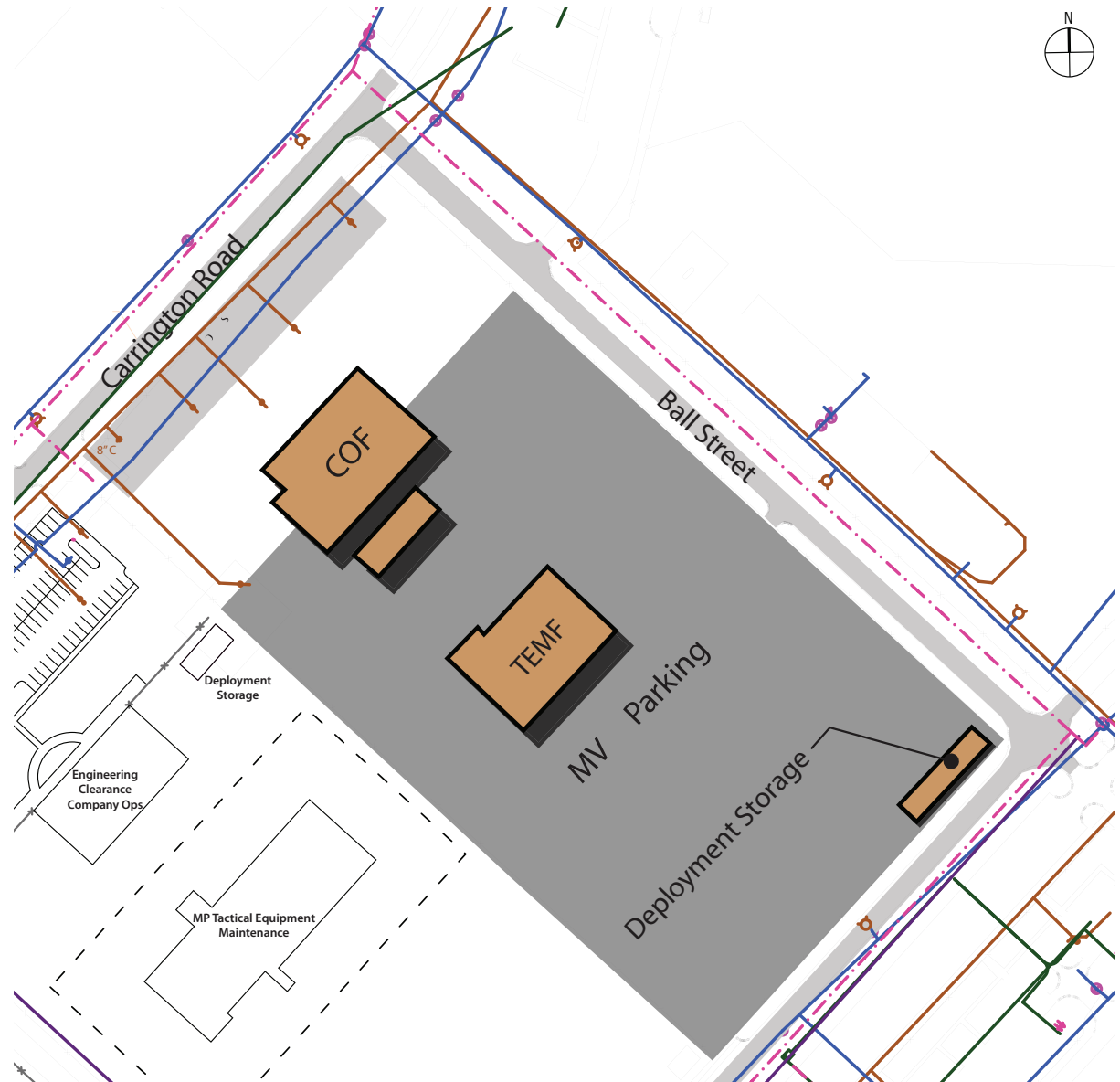


Figure 3.11 POL Truck Company UMF Site Utilities

Section:

**Patriot Battalion Complex (PN 69177)
POL Truck Company UMF (PN 69307)
Area Development Guides**



**US Army Corps
of Engineers®**

JACOBS / HUITT-ZOLLARS

APPENDIX G

GIS DATA

NOT USED

APPENDIX H

EXTERIOR SIGNAGE

Exterior Signage

All signs will either be pre-manufactured from materials meeting or exceeding the EPA required minimum recycled content or fabricated by DPW. Low quality and “homemade” signs are prohibited.

Locate signs where they are visible and unobstructed.

All signs use Helvetica. Exceptions to be approved by DPW.

Traffic signs will follow guidelines in the Federal Highway Administration’s “Standard Alphabets for Highway Signs and Pavement Markings” standards.

Sign Mounting and Location

Locate identification signs typically at building entrances and/or other parts of the building visible from the main access street. Building signs should be visible from the main circulation paths to the building (vehicular or pedestrian).

Place building and/or facility identification signs within the first 20 percent of the distance closest to the road between the road and the building. These signs shall be placed so as not to obscure any other identification, information or vehicular regulatory signs.

The minimum distance between sign and driveway or intersection should normally be 100 feet.

Mounting Signs on Buildings.

No sign may be mounted on the outside of the door, except small signs (one square foot or less) that indicate required use of an alternate entrance.

No sign may be attached or mounted to roofs and parapets.

No sign shall be painted or applied directly onto the surface of a building.

No permanent signs shall obstruct any window, door, fire escape, ladder, or opening intended for light, air, or egress.

No sign shall interrupt the vertical and horizontal features of the façade.

No sign may be attached to utility poles except for pole identification or warning.

Sign Descriptions:

Building Number: 30-inch by 10-inch reflective white metal panel with 8-inch black Helvetica Regular letters.

Identification Signs shall be per Technical Manual (TM) 5-807-10, Signage. Type B and Type C shall be brown metal mounted on brown metal posts. Colors shall be white letters and numbers on standard brown background. Include the Building Number and Street address such as “2475 Defense Av”.

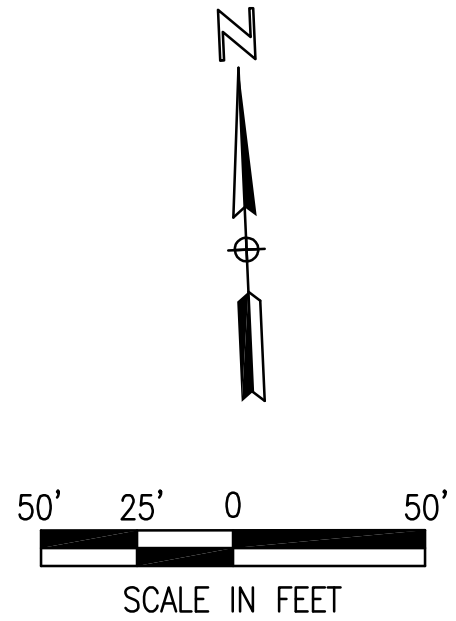
APPENDIX I

ACCEPTABLE PLANTS LIST

NOT USED – NO REQUIREMENTS

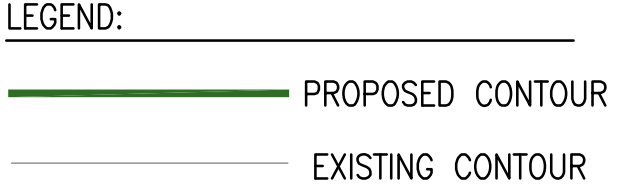
APPENDIX J

DRAWINGS



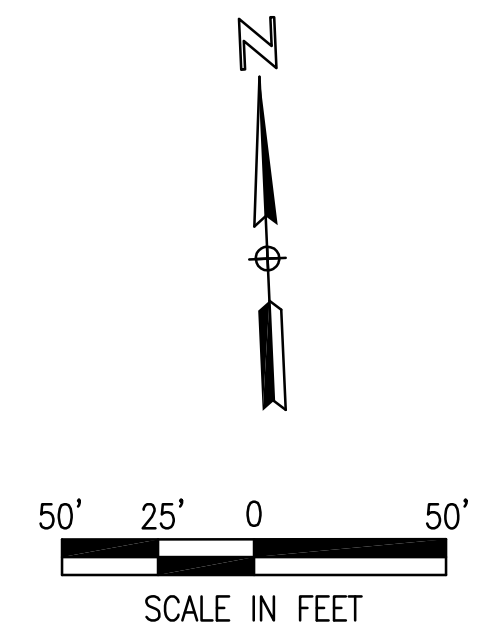
— SS_x — EX. SANITARY SEWER MAIN
— W_x — EX. WATER MAIN
— G_x — EX. GAS MAIN
— E_x — EX. ELECTRIC
~~//////~~ UTILITY TO BE REMOVED
OR ABANDONED

DATE: NOVEMBER 19, 2009
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RFP EXHIBIT - C
PROPOSED GRADES

Sheet
reference
number:
EX-C

Sheet 1 of 1



LEGEND:

- SS_x EX. SANITARY SEWER MAIN
- W_x EX. WATER MAIN
- G_x EX. GAS MAIN
- E_x EX. ELECTRIC
- CU_x EX. COMMUNICATIONS
- SS PROP. SANITARY SEWER MAIN
- W PROP. WATER MAIN
- F PROP. FIRE
- MG PROP. GAS MAIN
- EU PROP. ELECTRIC
- CU PROP. COMMUNICATIONS
- PROP. STORM DRAIN
- 1 UTILITY CONNECTION POINT

NOTES:

1. CONTRACTOR RESPONSIBLE FOR ALL UTILITY WORK PAST UTILITY CONNECTION POINT SHOWN INCLUDING (BUT NOT LIMITED TO) ALL DUCT BANK, ELECTRICAL WIRING TO TRANSFORMER, WATER, SEWER, GAS AND STORM PIPING, AND GAS METER.
2. CONTRACTOR TO MAKE ALL UTILITY CONNECTIONS AT UTILITY CONNECTION POINT SHOWN.

DATE: NOVEMBER 19, 2009

JACOBS / HUITT-ZOLLARS

SUSTAINMENT BRIGADE TEMF
FORT BLISS, TEXAS

RFP EXHIBIT - D
UTILITIES

Sheet
reference
number:
EX-D
Sheet 1 of 1

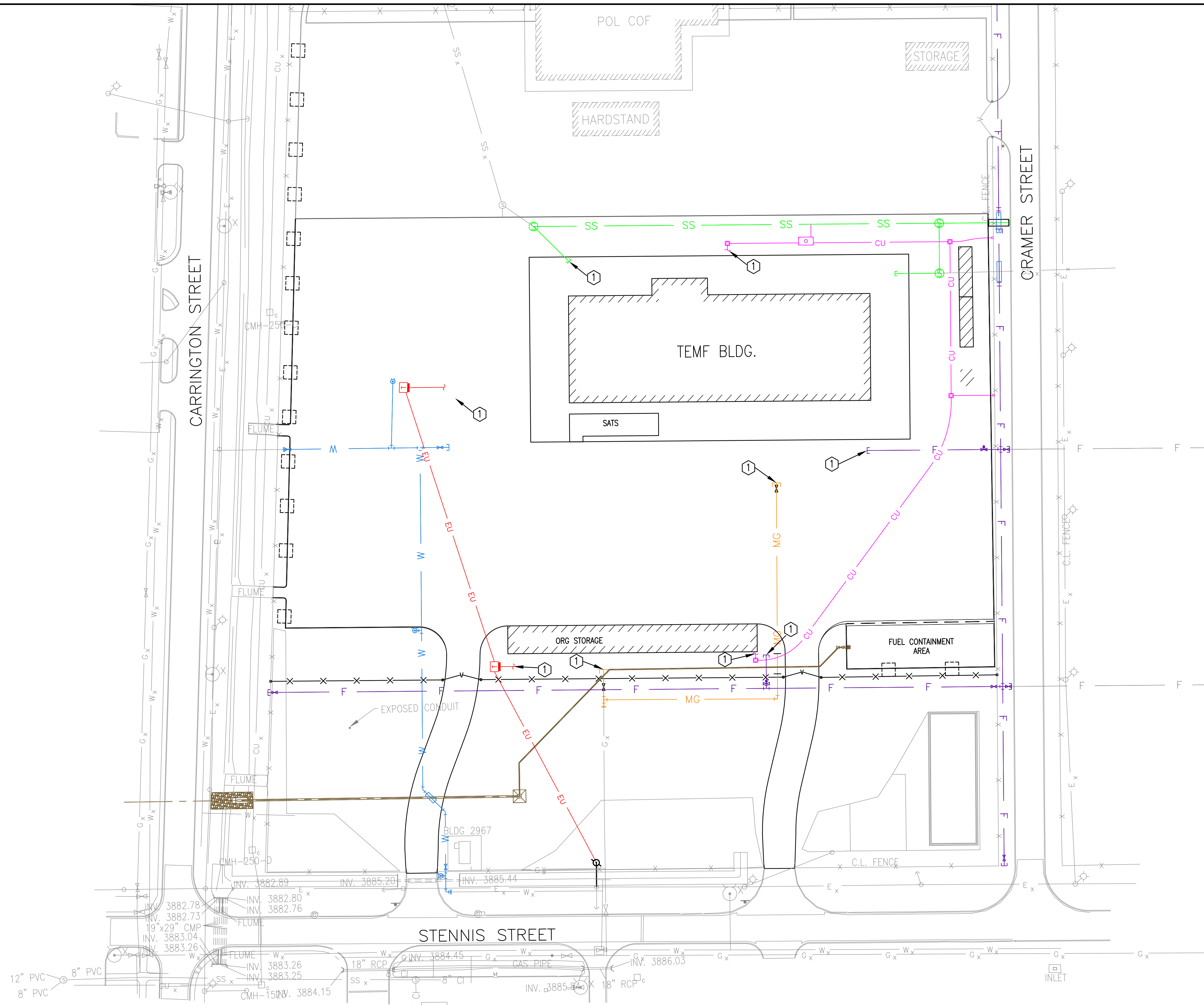
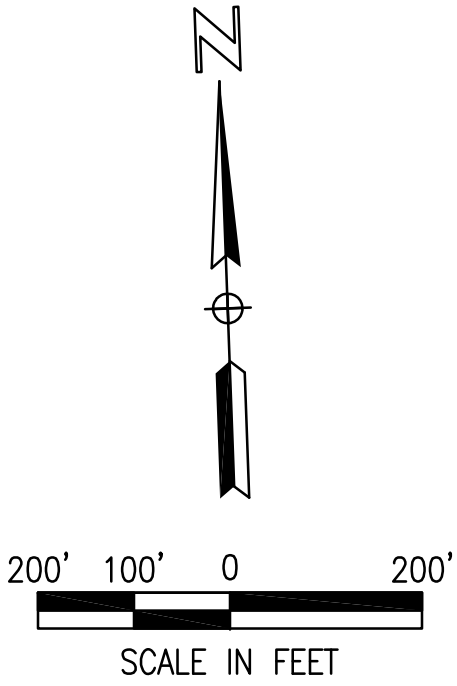
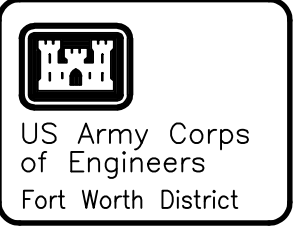
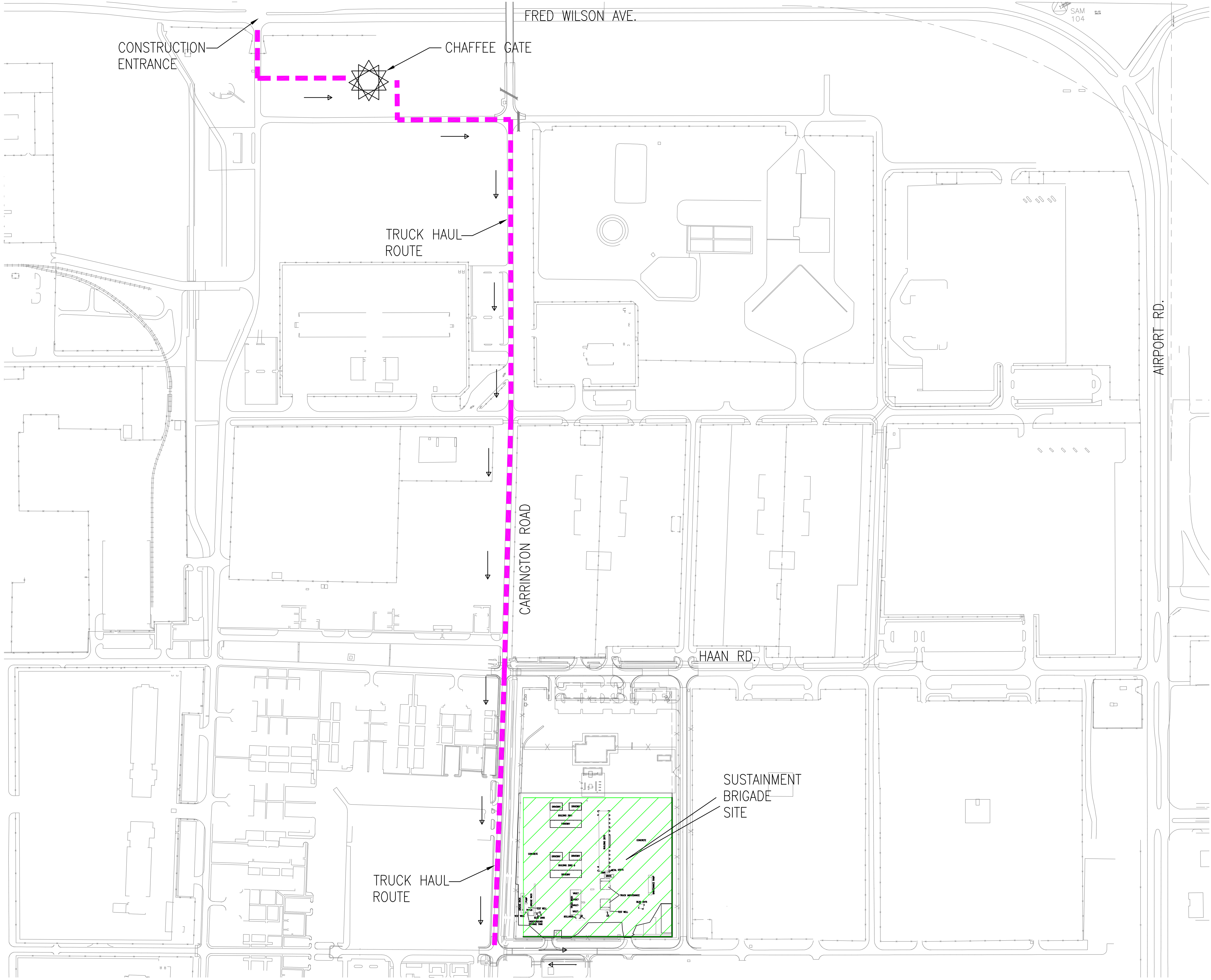


PLATE 11/25/2009 10:48AM H:\PROJ\VERTBUS\UE\UDT\045\DWG\REF EXHIBITS\0451-SUSTAINMENT BRIGADE\REF EX-E.DWG



LEGEND:

- CONSTRUCTION ACCESS ROUTE AND HAUL ROAD
- AREA OF WORK
- LAYDOWN AREAS

GENERAL NOTES:

1. ALL COMMERCIAL TRAFFIC (TRUCKS AND POV's) MUST ENTER AND EXIST THROUGH THE CHAFFEE GATE. CONSTRUCTION TRAFFIC IS NOT PERMITTED TO ENTER THROUGH THE ROBERT E. LEE GATE.
2. ALL COMMERCIAL TRAFFIC MUST STAY ON THE DESIGNATED HAUL ROUTE ROADWAYS AT ALL TIMES.
3. CONTRACTOR SHALL KEEP HAUL ROUTE AND ADJACENT ROADS FREE OF DIRT AND DEBRIS AT ALL TIMES.
4. CONTRACTOR SHALL PROTECT ALL PAVEMENTS AND EXISTING UTILITIES FROM HEAVY EARTH MOVING EQUIPMENT. PROVIDE TRAFFIC CONTROL MEASURES AT ALL EQUIPMENT CROSSINGS.
10. HAUL ROUTE LOCATION IS SUBJECT TO CHANGE AT THE DISCRETION OF THE INSTALLATION AND MILITARY MISSIONS' STATUS.

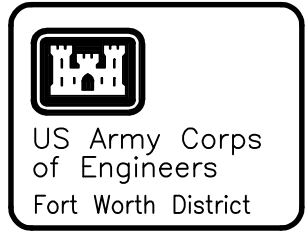
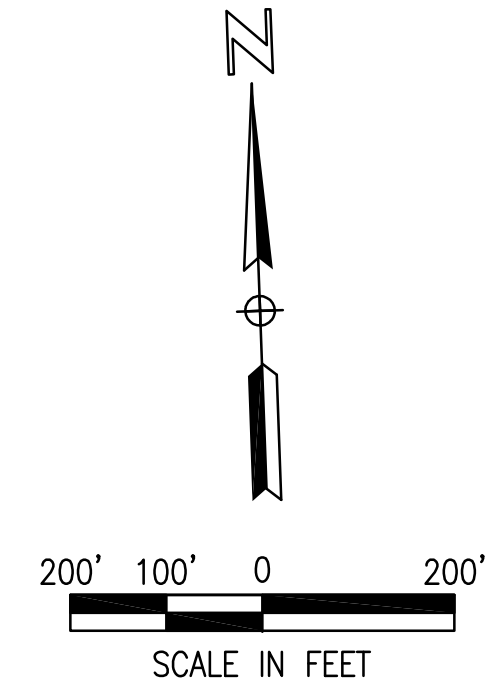
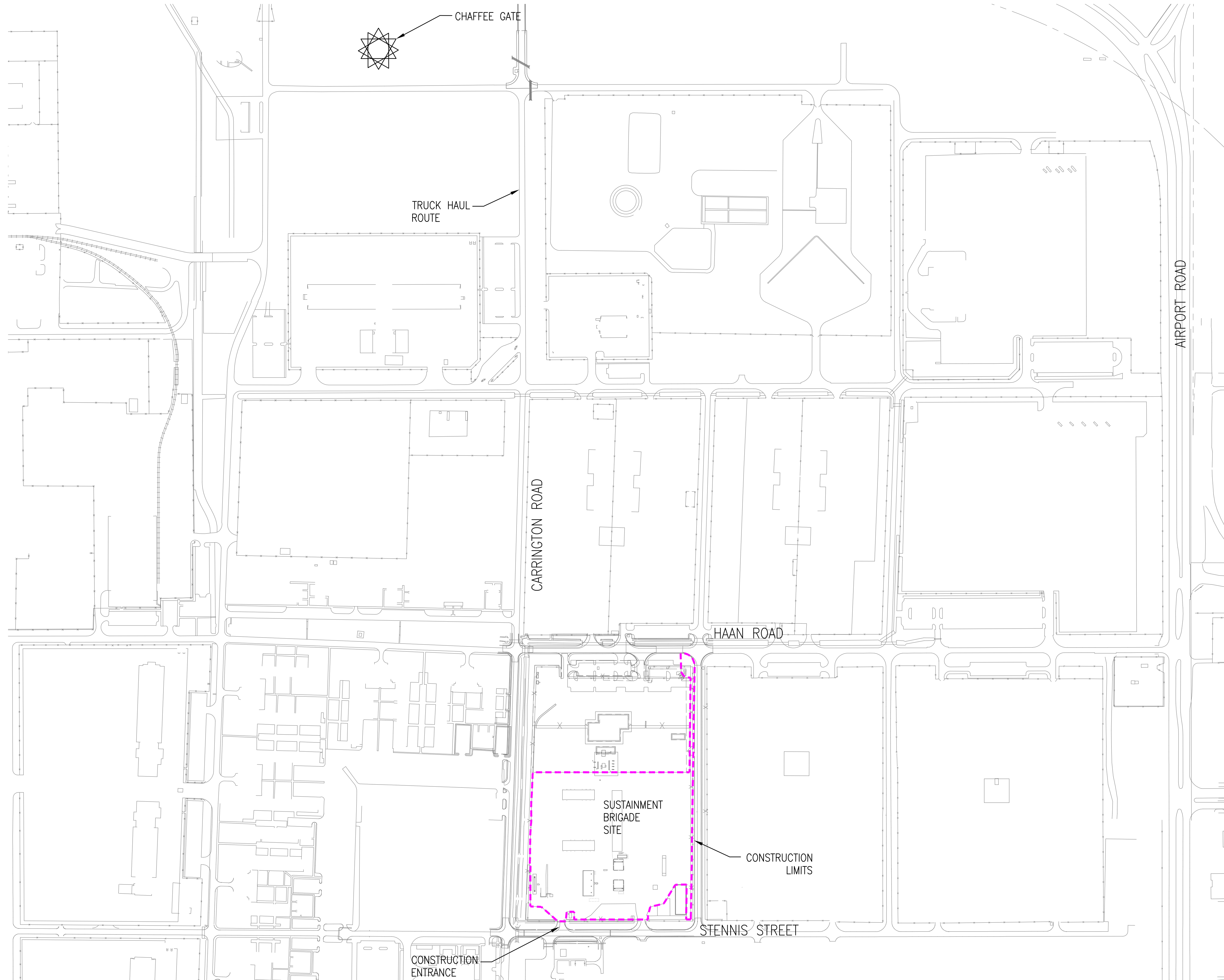
NOTE

HORIZONTAL AND VERTICAL CONTROL WILL BE PROVIDED TO THE CONTRACTOR IN ELECTRONIC FORMAT.

SUSTAINMENT BRIGADE TEMF
 FORT BLISS, TEXAS
 HAUL ROUTE
 SUSTAINMENT BRIGADE

Sheet
 reference
 number:
 EX-E
 5

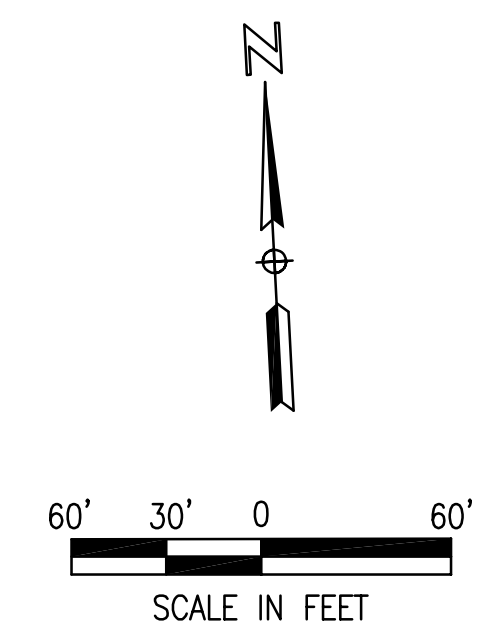
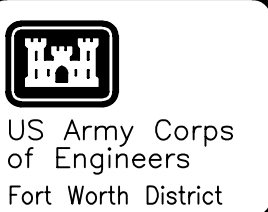
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DATE: NOVEMBER 25, 2009
JACOBS / HUITT-ZOLIARS

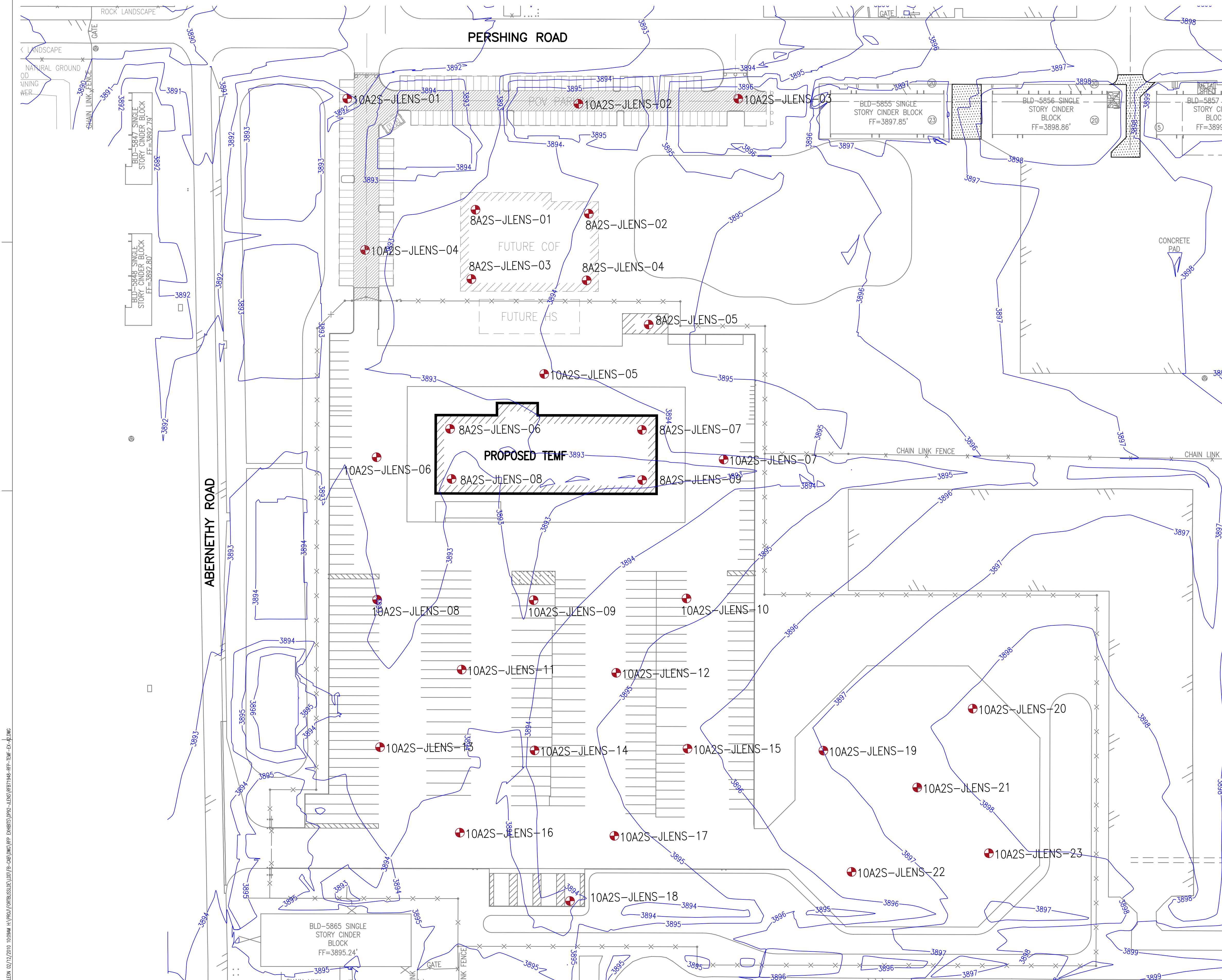
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FORT BLISS, TEXAS
CONSTRUCTION LIMITS
SUSTAINMENT BRIGADE

Sheet
reference
number:
EX-F



LEGEND:

	XXX	BORE HOLE POINT NUMBER AND APPROXIMATE LOCATION
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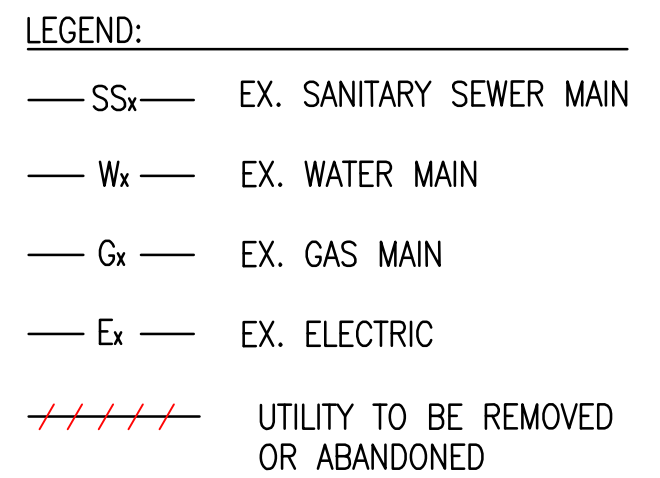
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FORT BLISS, TEXAS

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DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLLARS

REVISED
AM 005

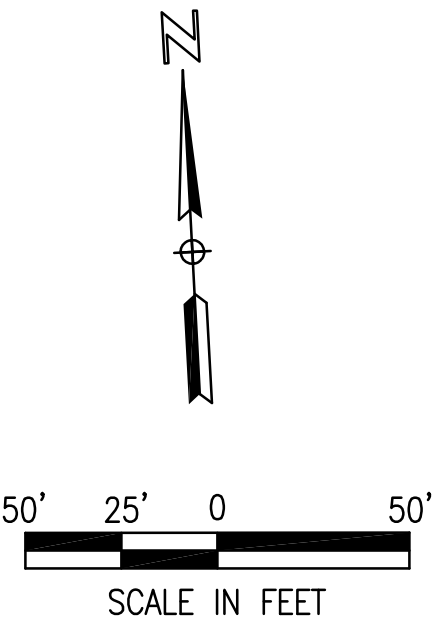
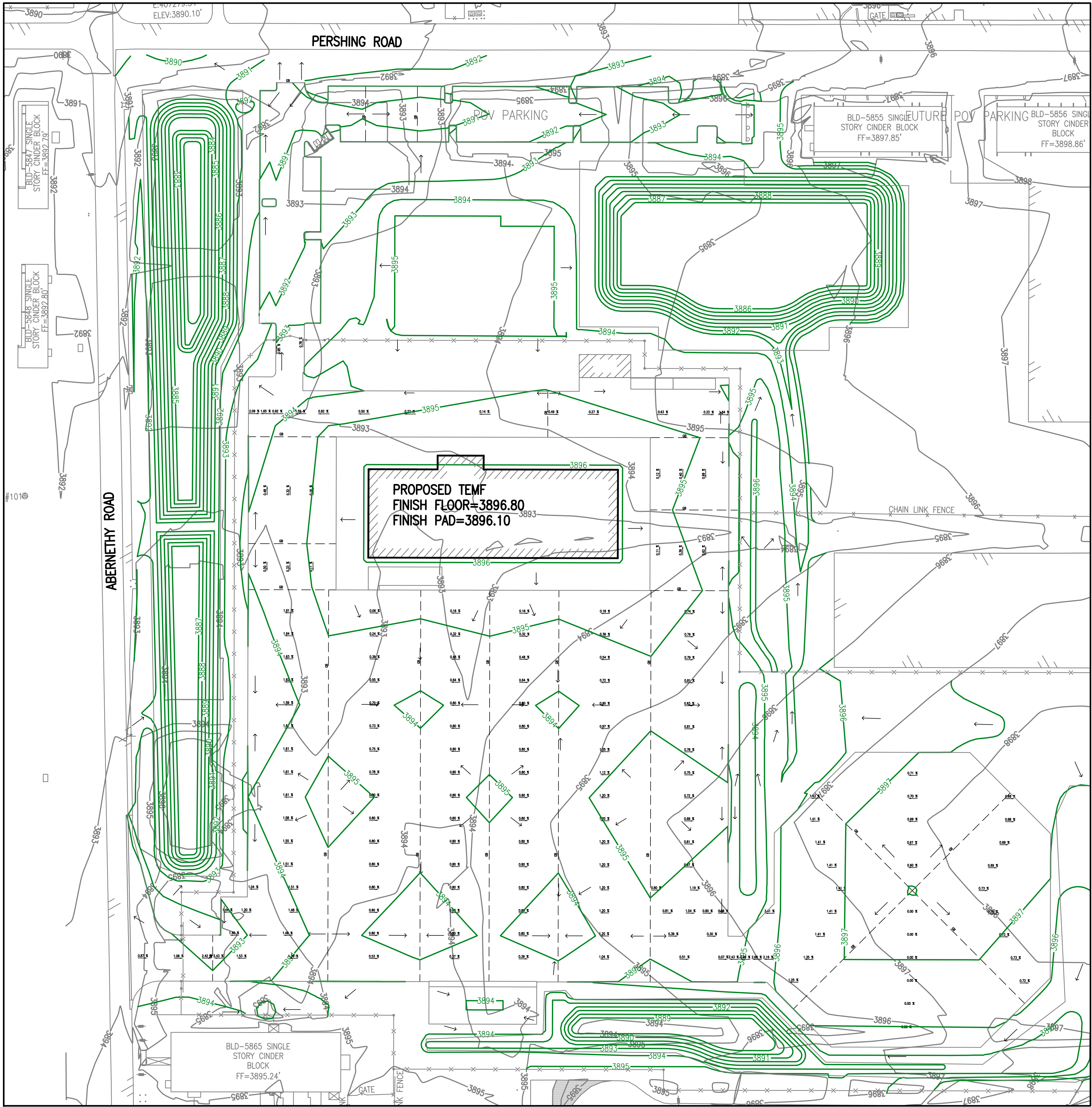
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JLENS IEMF
PORT BLISS, TEXAS

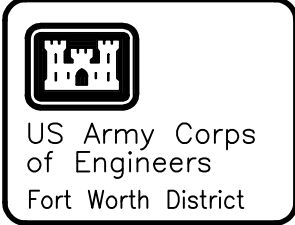
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SITE SURVEY

Sheet
reference
number:
EX-B



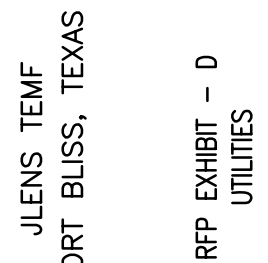
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 — EXISTING CONTOUR

DATE: NOVEMBER 19, 2009
 JACOBS / HUITT-ZOLLARS

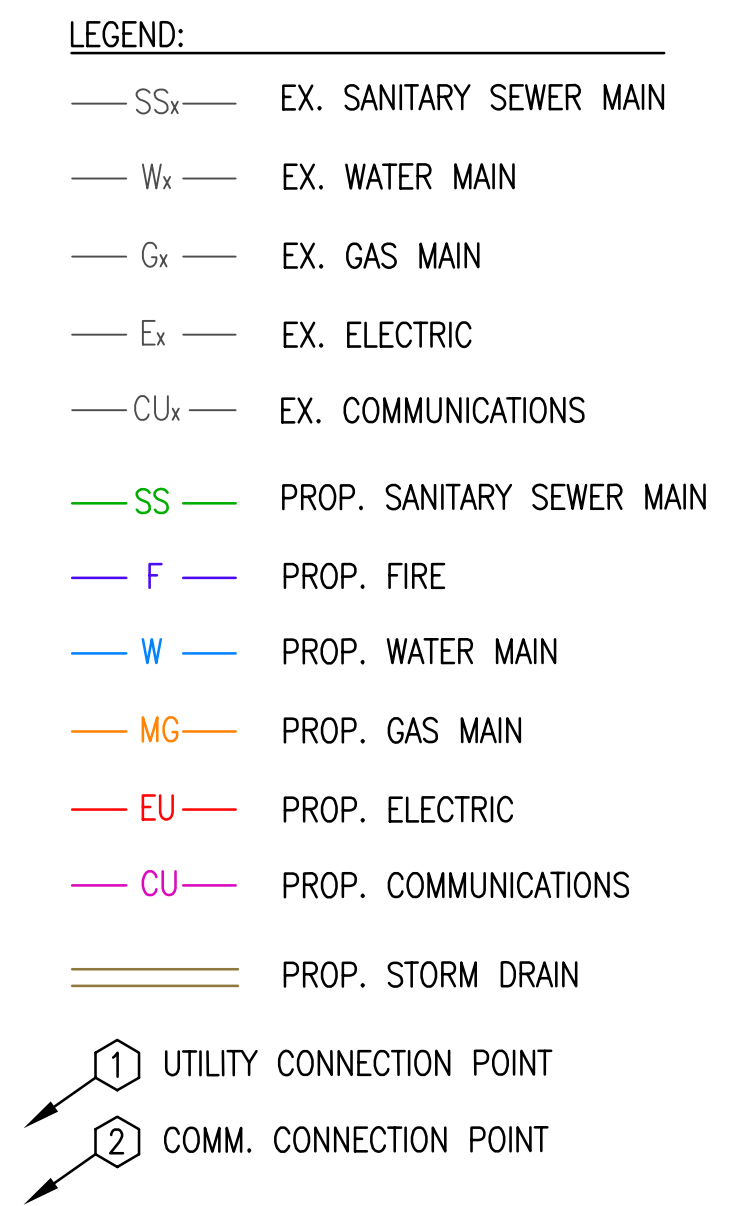


JLENS TEMF
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 RFP EXHIBIT - C
 PROPOSED GRADES

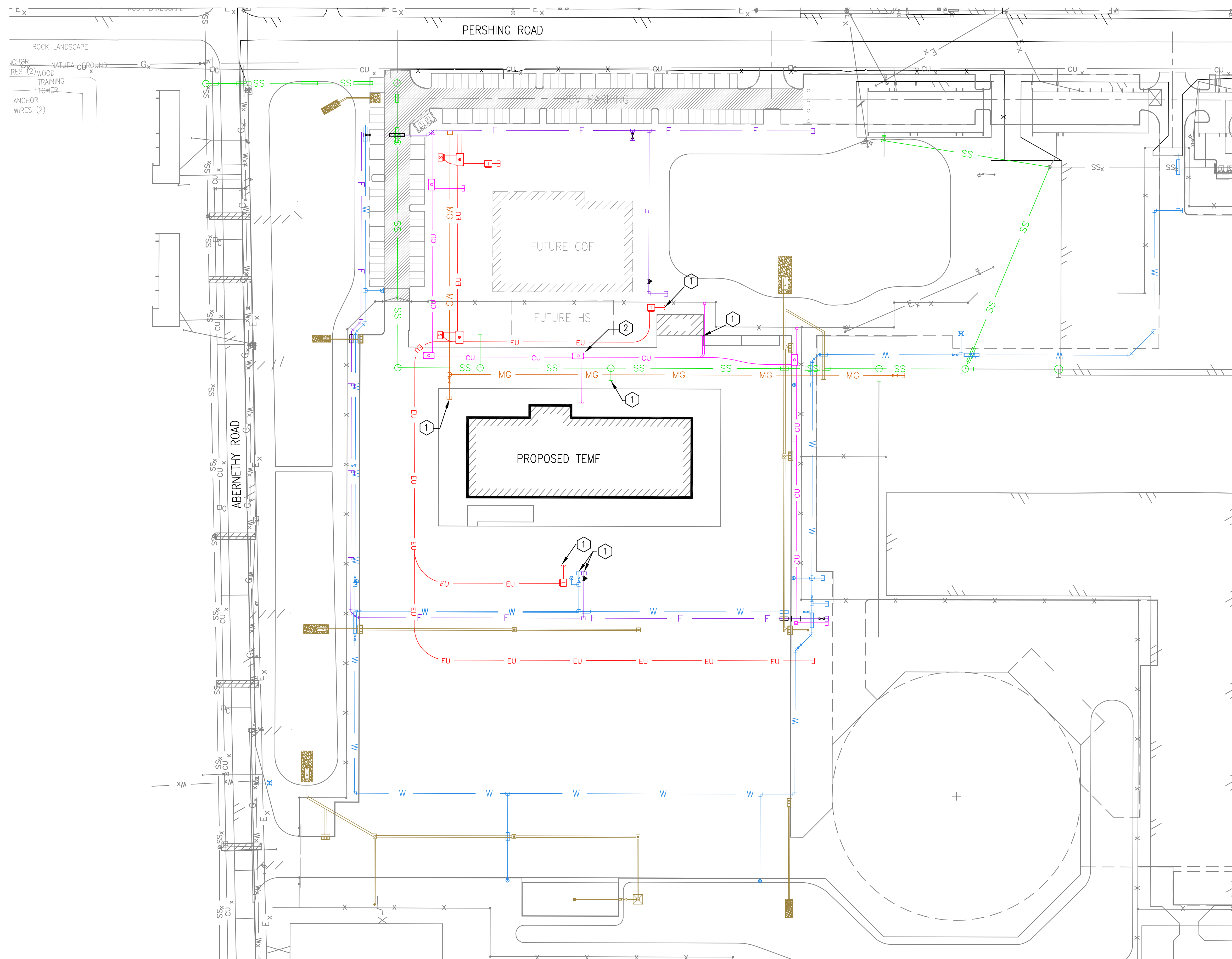
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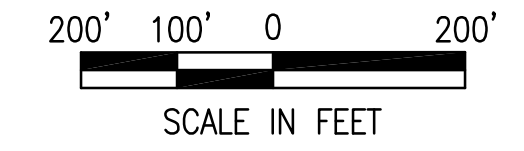
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DRT BLISS, TEXAS
RFP EXHIBIT - D
UTILITIES



DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLLARS

REVISÉ
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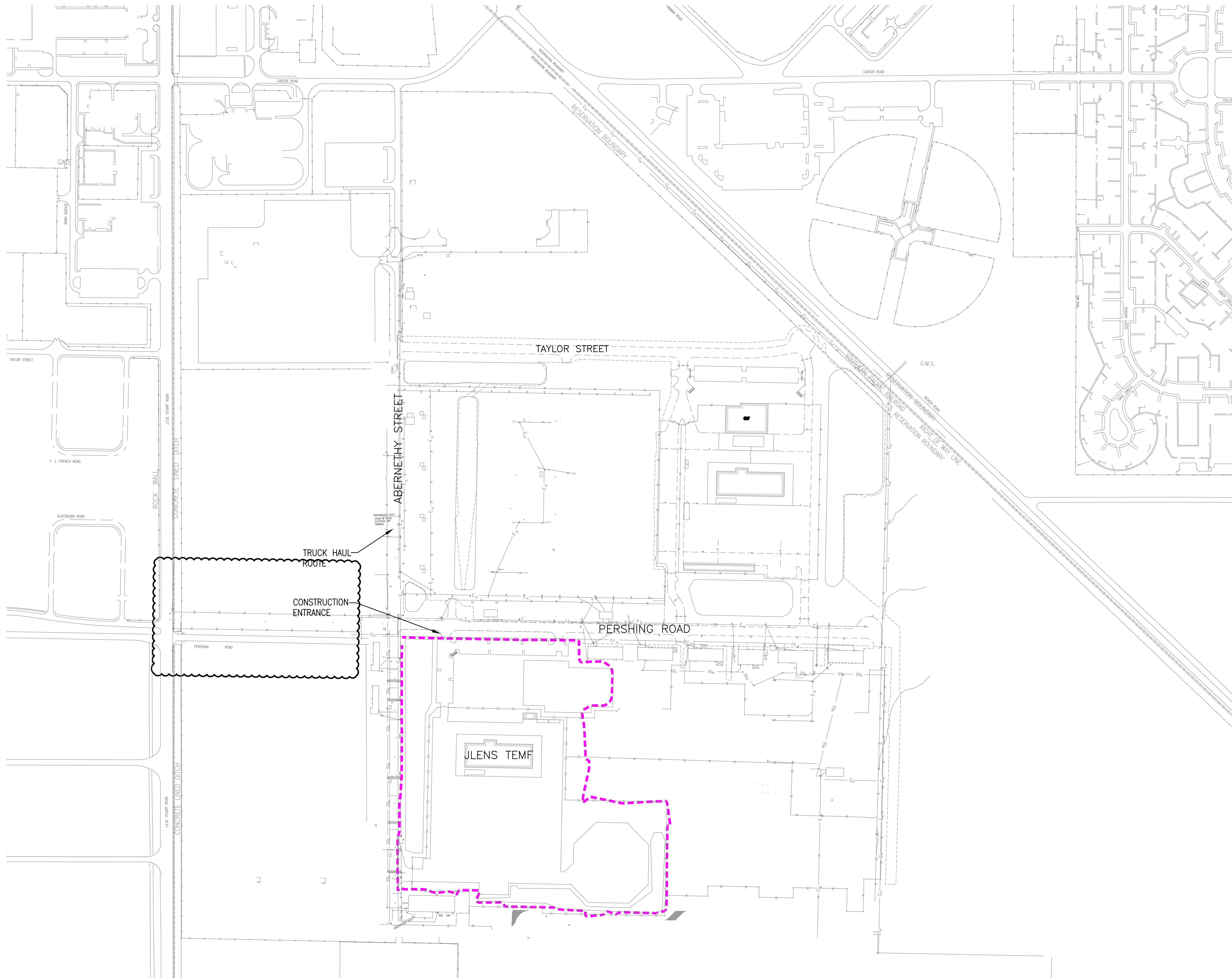
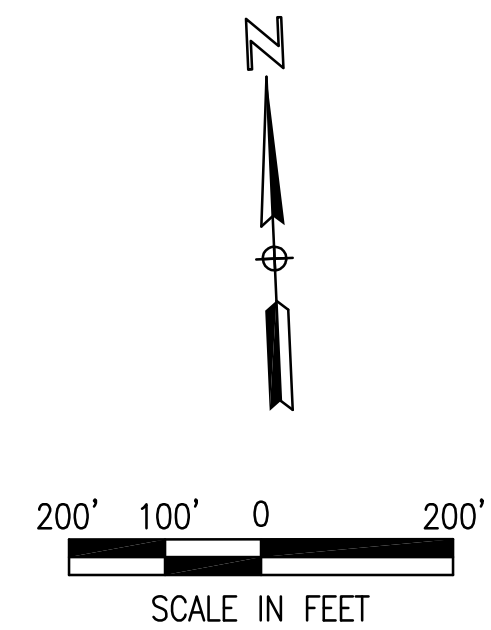
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DATE: NOVEMBER 19, 2009
JACOBS / HUITT-ZOLIARS

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FORT BLISS, TEXAS
RFP EXHIBIT -- E
HAUL ROUTE AND STAGING AREA

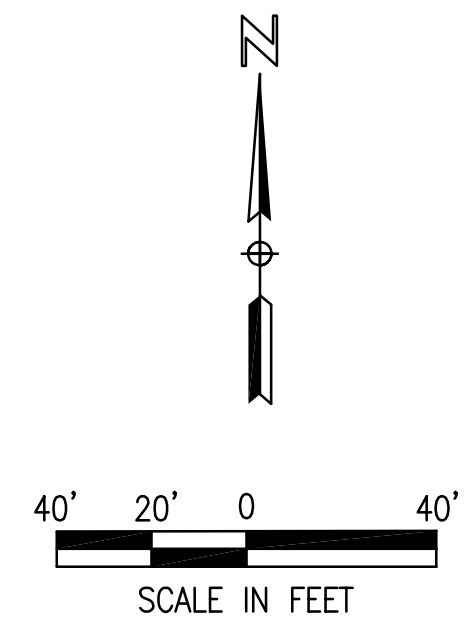
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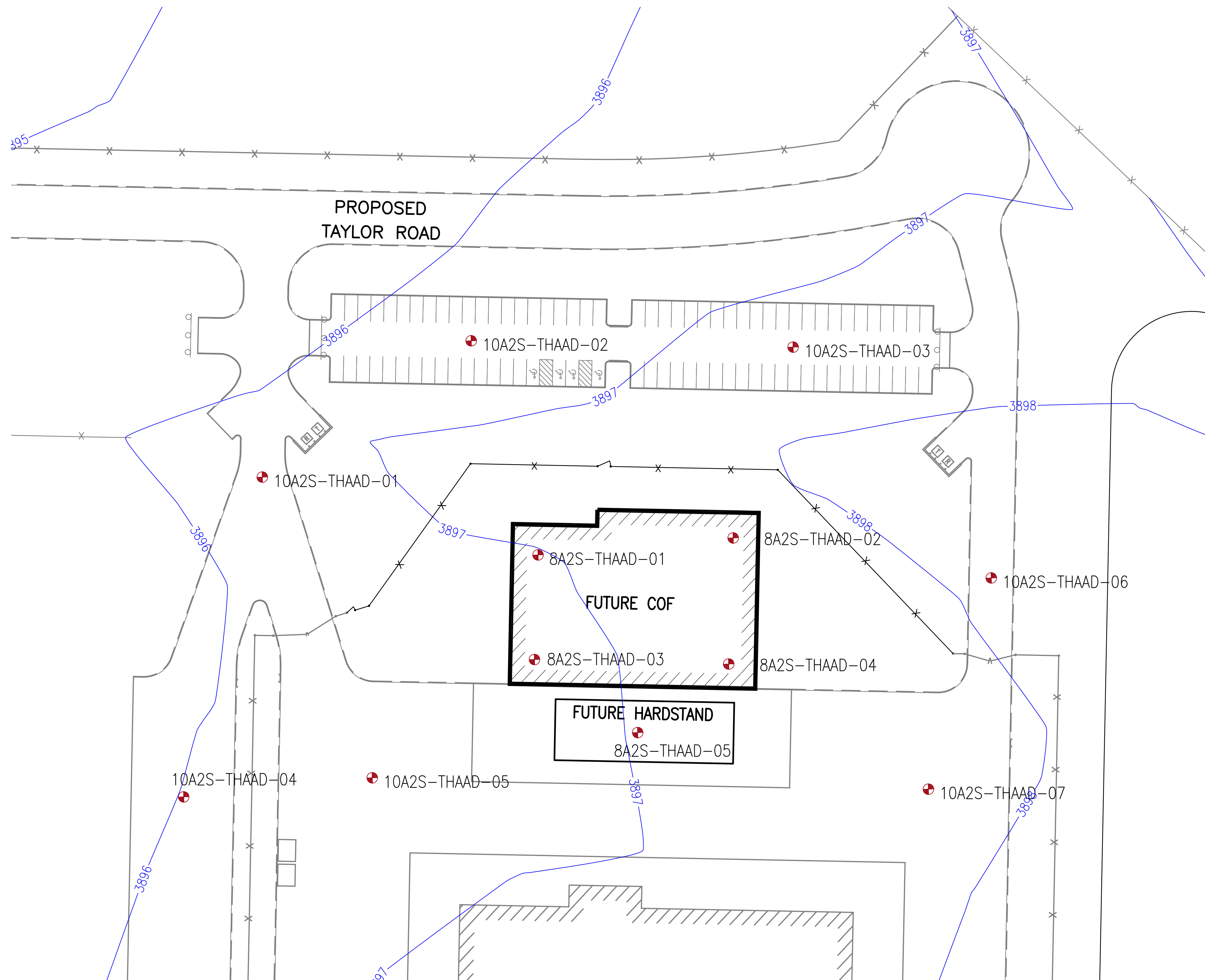
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JACOBS / HUITT-ZOLLARS

JLENS TEMP
FORT BLISS, TEXAS
RFP EXHIBIT - F
CONSTRUCTION LIMITS

Sheet
reference
number:
EX-F



LEGEND:
● XXX BORE HOLE POINT NUMBER
AND APPROXIMATE LOCATION

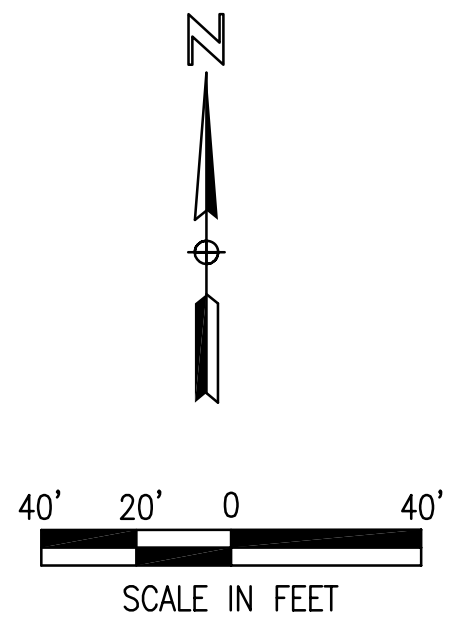


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JACOBS / HUITT-ZOLLARS

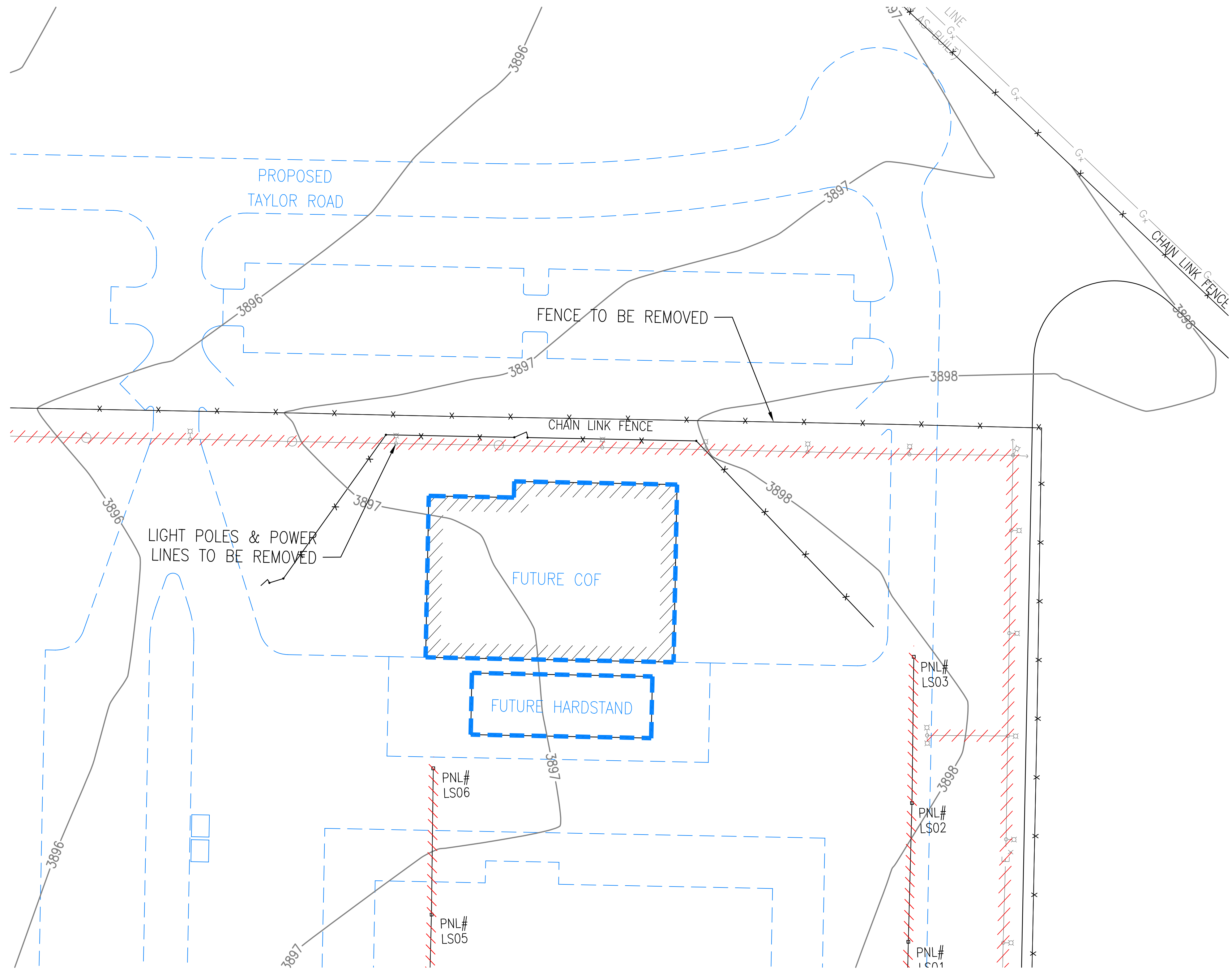
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AM 005

THAAD BATTERY COF
FORT BLISS, TEXAS
RFP EXHIBIT - A
GEOTECHNICAL BORE LOCATIONS

Sheet
reference
number:
EX-A



- LEGEND:
- SSx — EX. SANITARY SEWER MAIN
 - Wx — EX. WATER MAIN
 - Gx — EX. GAS MAIN
 - Ex — EX. ELECTRIC
 - ////// UTILITY TO BE REMOVED OR ABANDONED

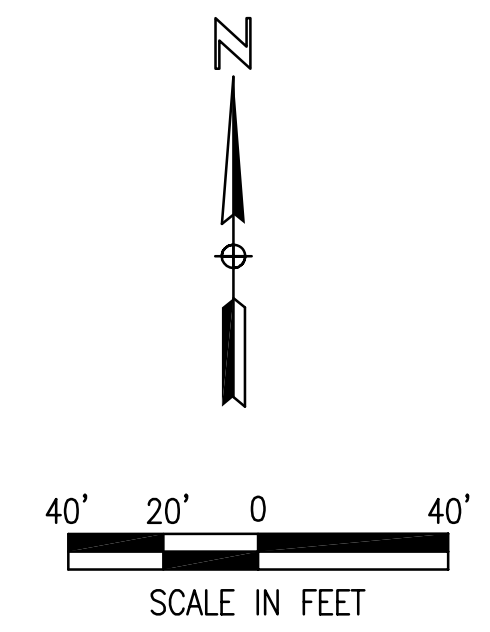


DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLIARS

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AM 005

THAAD BATTERY COF
FORT BLISS, TEXAS
RFP EXHIBIT - B
SITE SURVEY

Sheet
reference
number:
EX-B

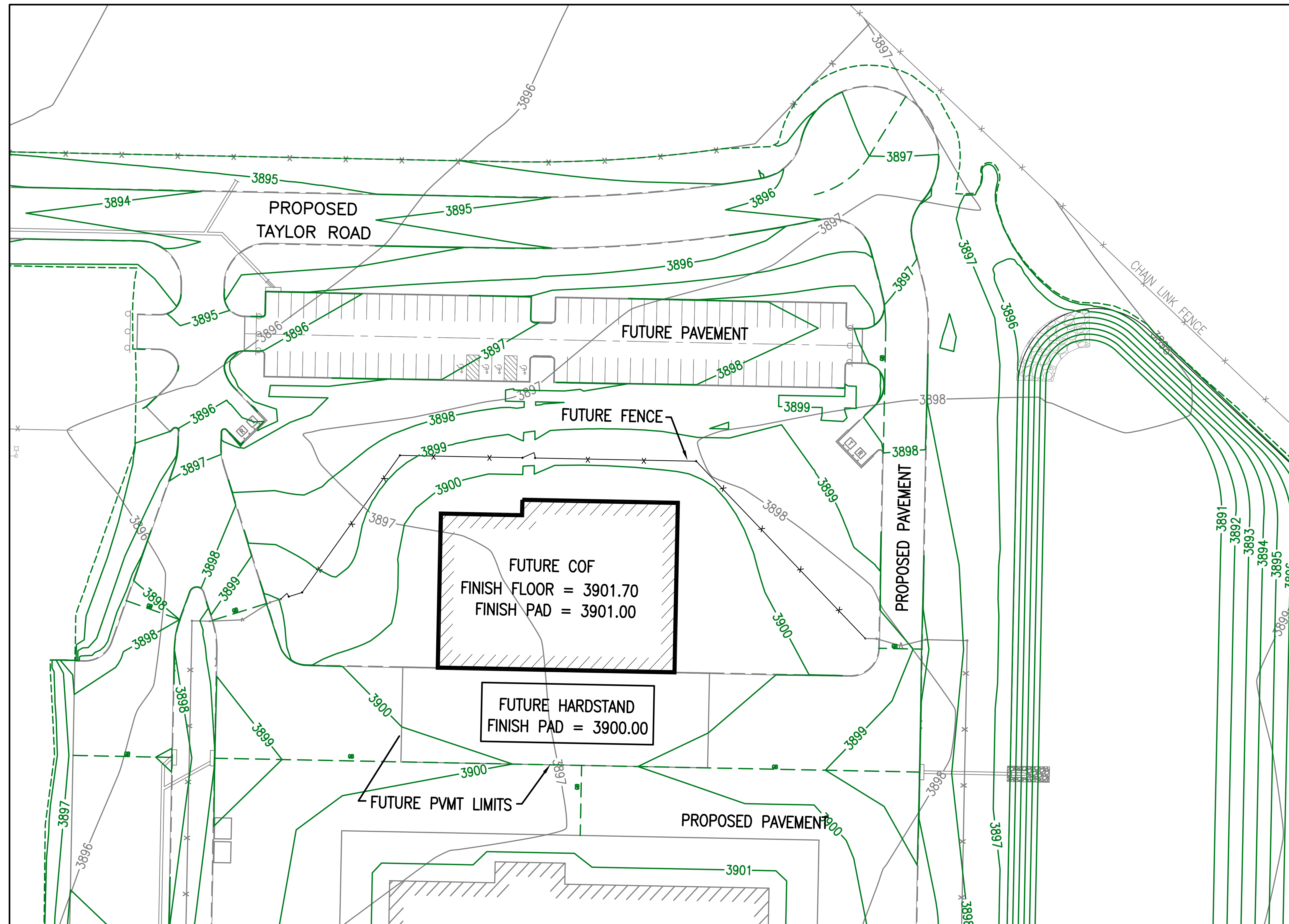


LEGEND:

 PROPOSED CONTOUR
 EXISTING CONTOUR

NOTES:

1. FUTURE FACILITIES WILL BE CONSTRUCTED BY THAAD COF CONTRACTOR. REFERENCE INFRASTRUCTURE DRAWINGS FOR LIMITS OF CONSTRUCTION.



DATE: FEBRUARY 11, 2010

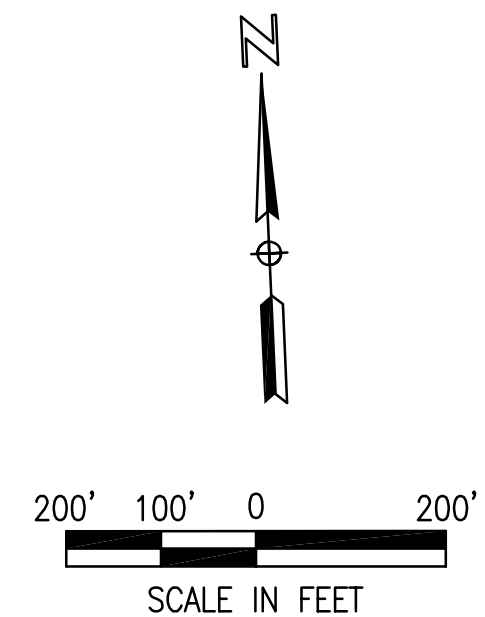
JACOBS / HUITT-ZOLLARS

REVISED
AM 005

THAAD BATTERY COF
FORT BLISS, TEXAS

RFP EXHIBIT - C
PROPOSED GRADES

Sheet
reference
number:
EX-C



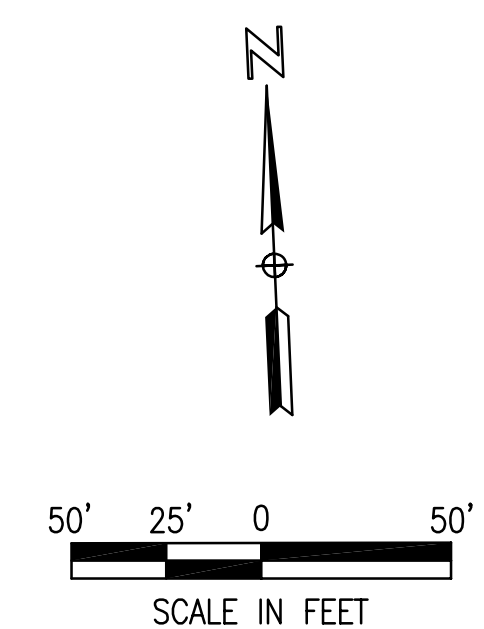
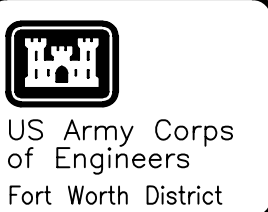
- NOTES:
1. TRUCK HAUL ROUTE TO BE MAINTAINED BY INFRASTRUCTURE CONTRACTOR FOR ACCESS TO SITE BY FUTURE COF CONTRACTOR. FIRE ACCESS SHALL ALSO BE MAINTAINED FOR DURATION OF CONSTRUCTION. THIS INCLUDES INFRASTRUCTURE, TEMF BUILDING AND COF BUILDING CONSTRUCTION.
 2. COORDINATE WITH FUTURE COF CONTRACTOR TO ENSURE ACCESS FOR CONSTRUCTION, DELIVERY AND FIRE, COORDINATION TO CONTINUE FOR DURATION OF TEMF AND INFRASTRUCTURE CONSTRUCTION.

DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLIARS

REVISED
AM 005

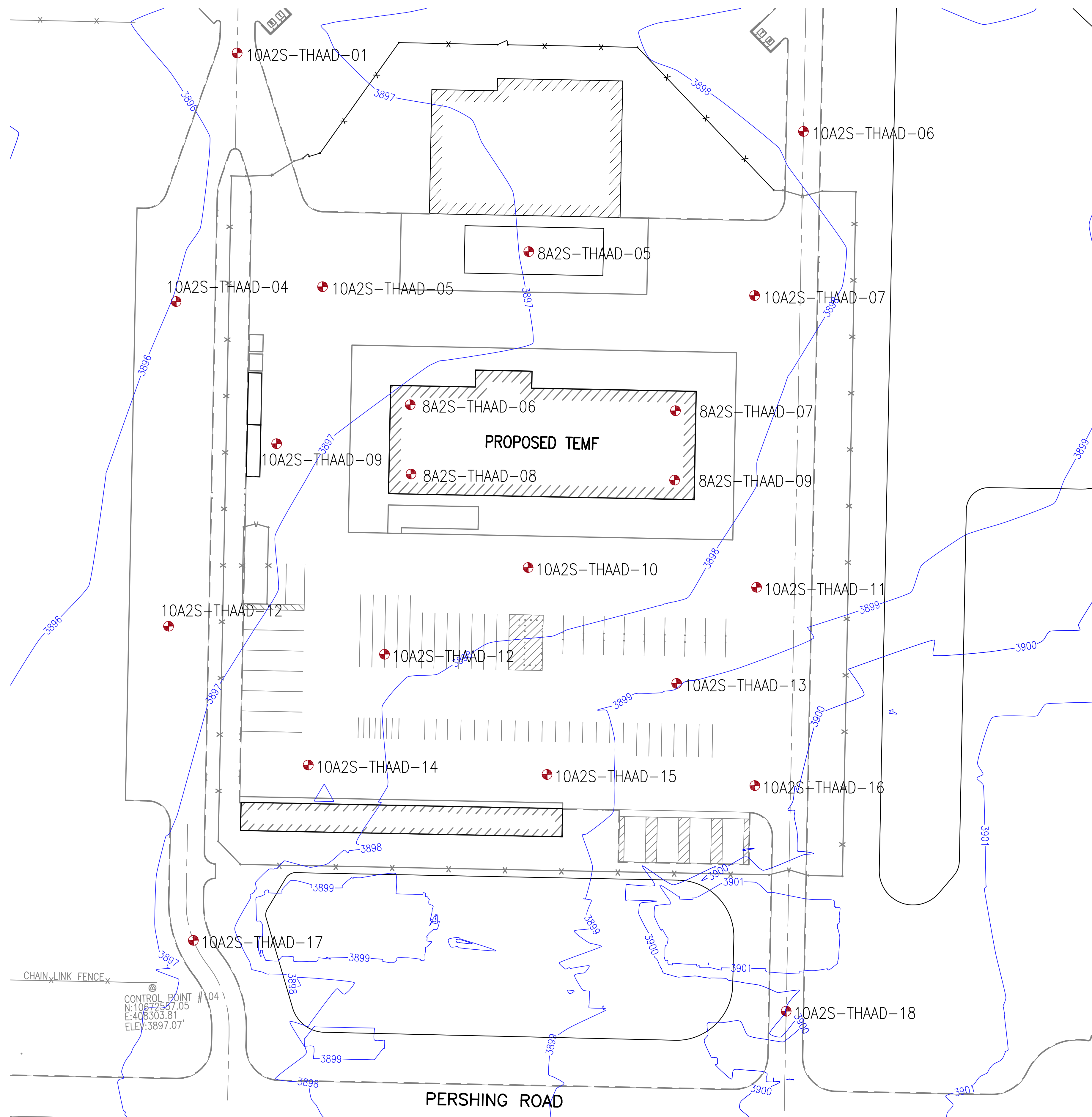
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FORT BLISS, TEXAS
RFP EXHIBIT - E
HAUL ROUTE AND STAGING AREA

Sheet
reference
number:
EX-E



LEGEND:

	BORE HOLE POINT NUMBER AND APPROXIMATE LOCATION
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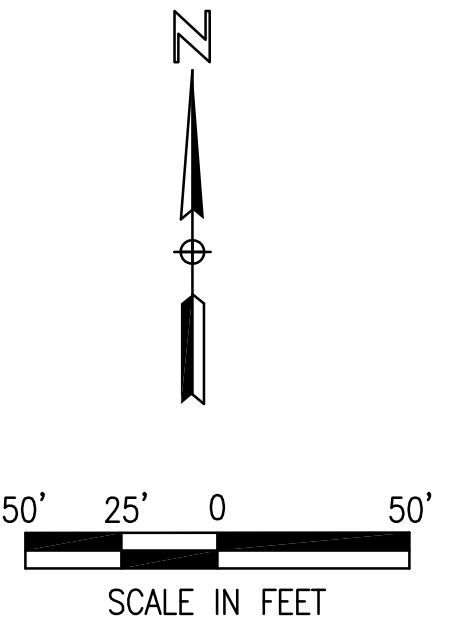
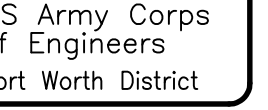
DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLLARS

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AM 005

THAAD BATTERY TEMF
FORT BLISS, TEXAS

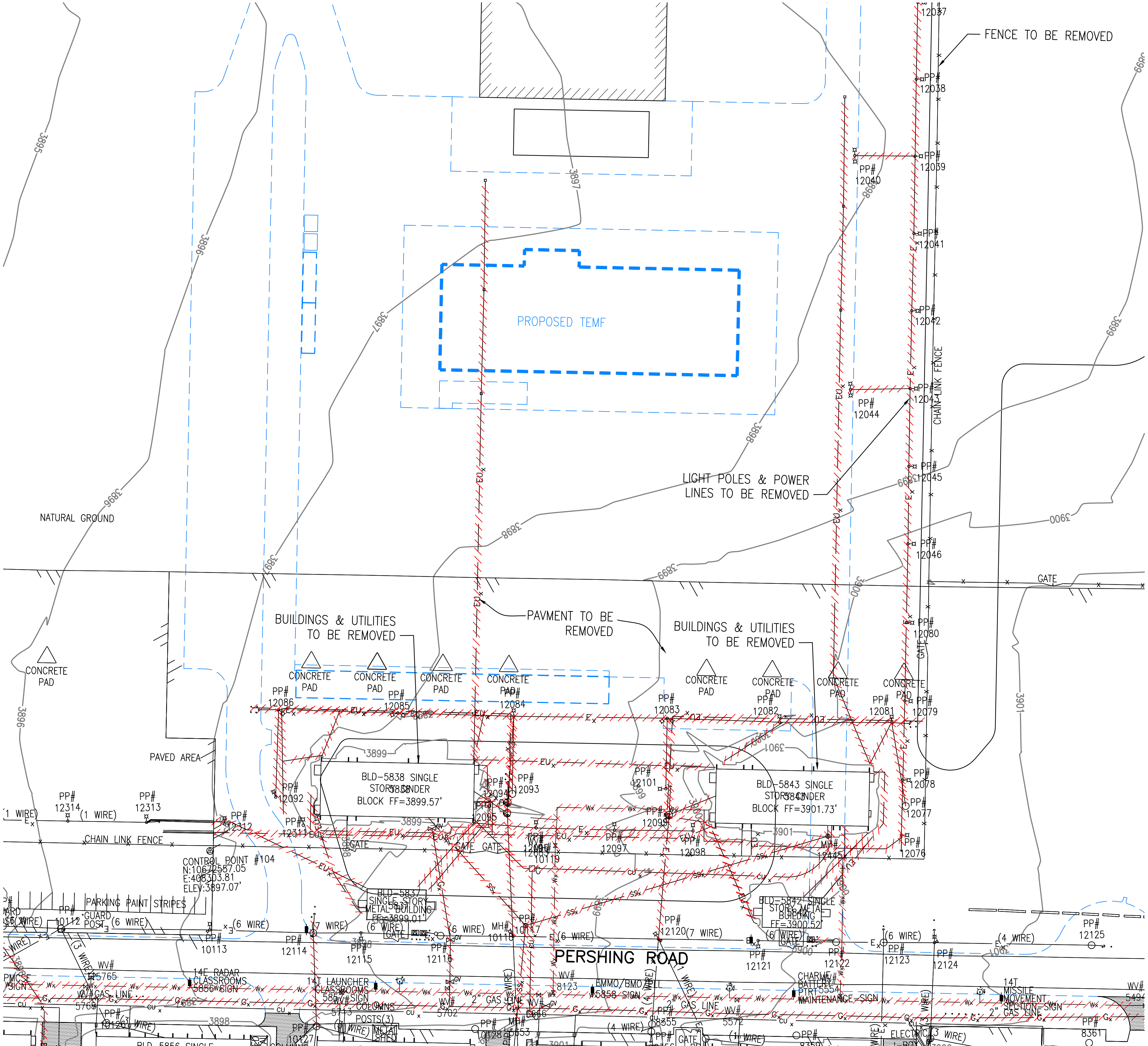
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LEGEND:

- | | |
|-----------------|---------------------------------------|
| — SSx — | EX. SANITARY SEWER MAIN |
| — Wx — | EX. WATER MAIN |
| — Gx — | EX. GAS MAIN |
| — Ex — | EX. ELECTRIC |
| ———— | UTILITY TO BE REMOVED
OR ABANDONED |



DATE: NOVEMBER 19, 2009

JACOBS / HUITT-ZOLIARS

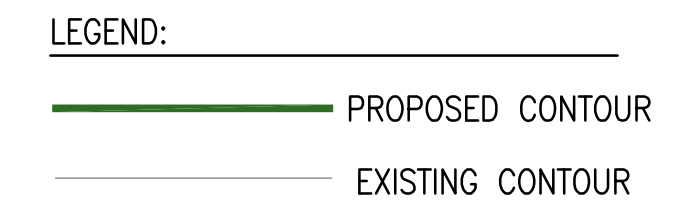
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FORT BLISS, TEXAS

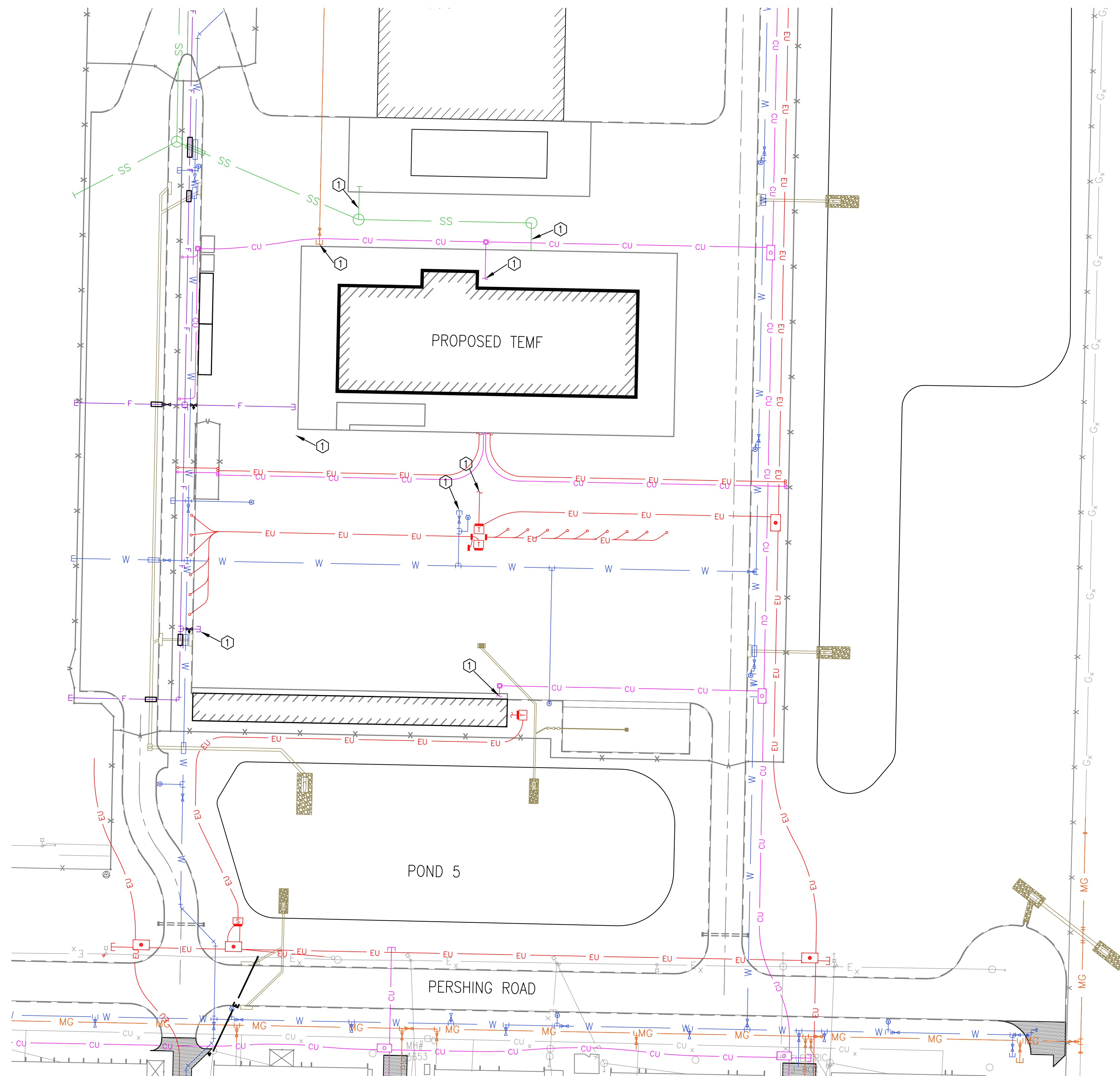
RFP EXHIBIT - B
SITE SURVEY

Sheet
reference
number:

EX-B

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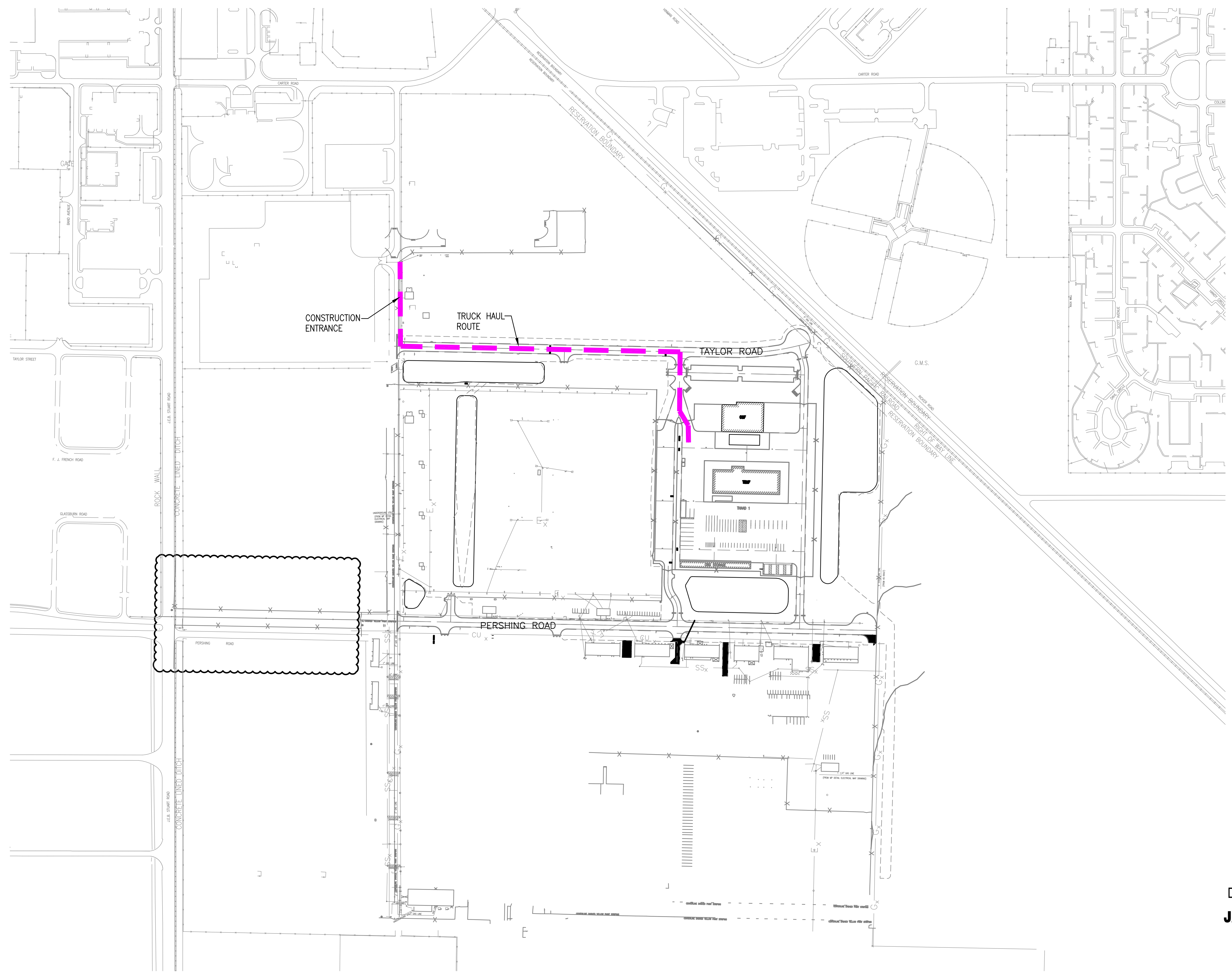
- LEGEND:
- SSx EX. SANITARY SEWER MAIN
 - Wx EX. WATER MAIN
 - Gx EX. GAS MAIN
 - Ex EX. ELECTRIC
 - CUx EX. COMMUNICATIONS
 - SS PROP. SANITARY SEWER MAIN
 - F PROP. FIRE
 - W PROP. WATER MAIN
 - MG PROP. GAS MAIN
 - EU PROP. ELECTRIC
 - CU PROP. COMMUNICATIONS
 - PROP. STORM DRAIN
- 1 UTILITY CONNECTION POINT

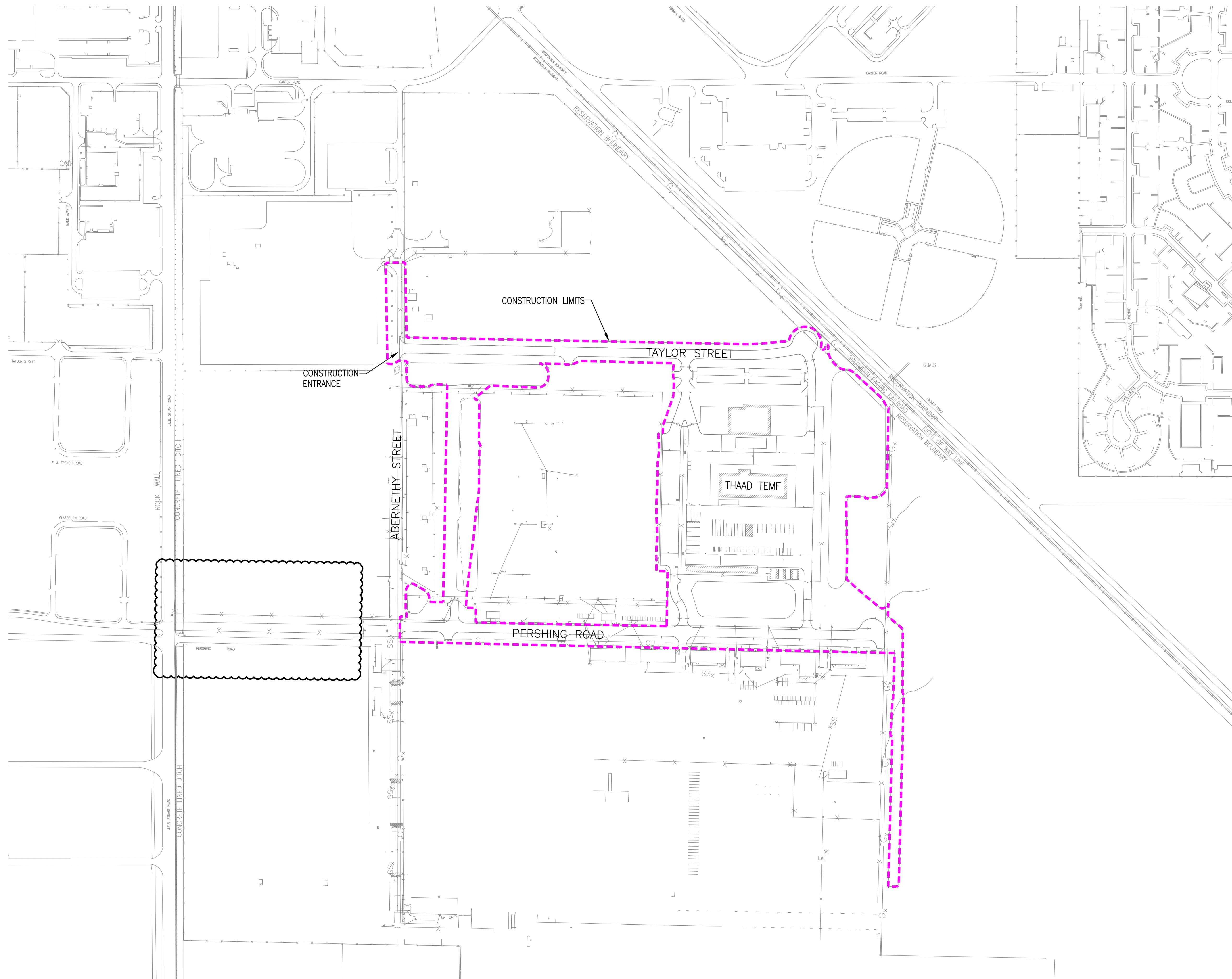
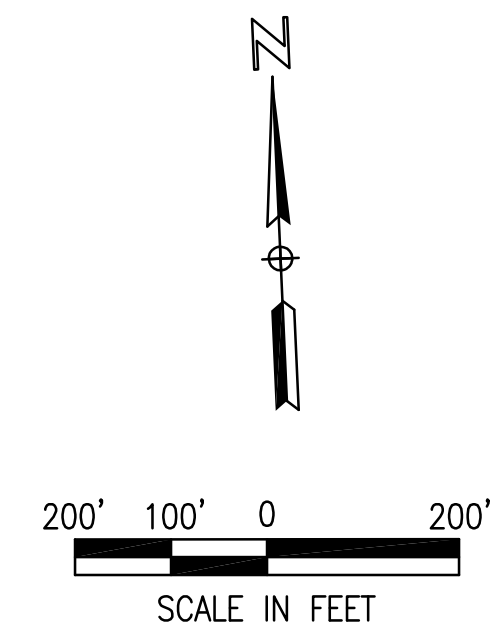
- NOTES:
1. CONTRACTOR RESPONSIBLE FOR ALL UTILITY WORK PAST UTILITY CONNECTION POINT SHOWN INCLUDING (BUT NOT LIMITED TO) ALL DUCT BANK, ELECTRICAL WIRING TO TRANSFORMER, WATER, SEWER, GAS AND STORM PIPING, AND GAS METER.
 2. CONTRACTOR TO MAKE ALL UTILITY CONNECTIONS AT UTILITY CONNECTION POINT SHOWN.

DATE: NOVEMBER 19, 2009
JACOBS / HUITT-ZOLLARS

THAAD BATTERY TEMF
FORT BLISS, TEXAS
RFP EXHIBIT - D
UTILITIES

Sheet
reference
number:
EX-D

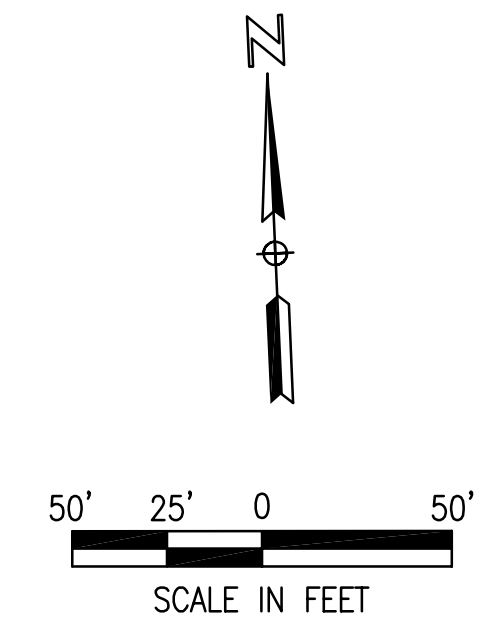




DATE: NOVEMBER 25, 2009
JACOBS / HUITT-ZOLLARS

THAAD BATTERY TEMF
FORT BLISS, TEXAS
RFP EXHIBIT - F
CONSTRUCTION LIMITS

Sheet
reference
number:
EX-F



TAYLOR STREET

THAAD COF
SITE LIMITS

THAAD TEMF
INFRASTRUCTURE
SITE LIMITS

THAAD
COF

THAAD TEMF

DATE: FEBRUARY 11, 2010
JACOBS / HUITT-ZOLIARS

REVISED
AM 005

THAAD BATTERY TEMF
FORT BLISS, TEXAS
RFP EXHIBIT - G
THAAD COF SITE LIMITS

Sheet
reference
number:
EX-G

APPENDIX K

LIFE CYCLE COST ANALYSIS

UTILITY RATES

REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BLISS
1 PERSHING ROAD
FORT BLISS, TX 79916-3803

SEP 03 2008

IMSW-BLS-PWF

MEMORANDUM FOR All Reimbursable Fort Bliss Utilities Customers

SUBJECT: New Natural Gas Rates

1. New utility rates are determined in accordance with HQ USACE Installation Support Division Policies, as spelled out in Technical Note Number 420-41 (Revision 1).
2. Natural gas prices have increased 43 percent higher than last year's price. Effective 1 October 2008, the new natural gas rates provided below will apply. Category "A" represents the rates for sales to Federal Government and Non-Appropriated Fund (NAF) activities. Category "B" represents the rates for private or commercial organizations. **NOTE:** PROPANE and STEAM will be handled on a case by case basis. The following rates shown are for metered facilities.

	Unit	A	B
Natural Gas	CCF	\$1.3810	\$1.5606

3. The following rates are for unmetered facilities whose cost is determined by the area.

	Unit	A	B
Natural Gas	SF/mo	\$0.1315	\$0.1690

4. Point of Contact for this action is Mr. Anthony Nitkowski, Utilities Sales Officer, Business Operation Integration Division, Directorate of Public Works, DSN 978-5465, email anthony.nitkowski@conus.army.mil.

DAVID N. SHAFII, P.E.
Director of Public Works

REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BLISS
1 PERSHING ROAD
FORT BLISS, TX 79916-3803

IMSW-BLS-PWF

9 JUNE 2008

MEMORANDUM FOR All Fort Bliss Utilities Customers

SUBJECT: New Utility Rates Effective 1 January 2008

1. New utility rates were determined in accordance with HQ USACE Installation Support Division Policies, as spelled out in Technical Note Number 420-41 (Revision 1).
2. The new rates are listed below. Category "A" represents the rates for sales to Federal Government and Non-Appropriated Fund (NAF) activities. Category "B" represents the rates for sales to private or commercial organizations. **NOTE:** PROPANE and STEAM will be handled on a case by case basis. The following rates shown are for metered facilities.

	Unit	A	B
Electricity	KWh	\$0.1352	\$0.1489
Natural Gas	CCF	\$1.1328	\$1.2801
Water	KGal	\$2.9280	\$3.9409
Sewage	KGal	\$2.1410	\$2.5197

3. The following rates are for unmetered facilities whose cost is determined by the area.

	Unit	A	B
Electricity	SF/mo	\$0.3851	\$0.4351
Natural Gas	SF/mo	\$0.0920	\$0.1183
Water	SF/mo	\$0.0288	\$0.0325
Sewage	SF/mo	\$0.0289	\$0.0327

4. Point of Contact for this action is Mr. Anthony Nitkowski, Utilities Sales Officer, Business Operation Integration Division, Directorate of Public Works, DSN 979-5470, email anthony.nitkowski@conus.army.mil.

FOR THE COMMANDER:

DAVID N. SHAFII, P.E.
Director of Public Works

Friday, February 19, 2010

LEED Project Credit Guidance

This spreadsheet indicates Army required credits, Army preferred credits, project-specific ranking of individual point preferences, assumptions guidance for individual credits, and references to related language in the RFP for individual credits.

LEED 2.2 Credit Paragraph	LEED Project Credit Guidance	Army Guidance: Required - Preferred - Avoid		Project Preference Ranking: (1=most preferred, blank=no preference, X=preference not applicable to this credit, Rqd=required)	
PAR	FEATURE	REMARKS			
SUSTAINABLE SITES					
SSPR1	Construction Activity Pollution Prevention (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.	
SS1	Site Selection		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.	

SS2	Development Density & Community Connectivity - OPTION 1 DENSITY		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.
	Development Density & Community Connectivity - OPTION 2 CONNECTIVITY		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.
SS3	Brownfield Redevelopment		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.
SS4.1	Alternative Transportation: Public Transportation Access		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	Pref		Assume that non-transient building occupants are NOT housed on Post unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1			Requires provision of vehicles, which cannot be purchased with construction funds. Assume Government will not provide vehicles unless indicated otherwise. Assume that 50% of GOV fleet is NOT alternative fuel vehicles unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	Pref		
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3			Requires provision of vehicle refueling stations. Installation must support type of fuel and commit to maintaining/supporting refueling stations.
SS4.4	Alternative Transportation: Parking Capacity	Pref		

SS5.1	Site Development: Protect or Restore Habitat			
SS5.2	Site Development: Maximize Open Space	Pref		Assume AGMBC option for aggregated open space at another location on the installation is not available to the project unless indicated otherwise.
SS6.1	Stormwater Design: Quantity Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS6.2	Stormwater Design: Quality Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS7.1	Heat Island Effect: Non-Roof			
SS7.2	Heat Island Effect: Roof	Pref		Coordinate with nearby airfield requirements, which may preclude this credit.
SS8	Light Pollution Reduction	Pref		
<u>WATER EFFICIENCY</u>				
WEPR1	Water Use Reduction (Version 3 only)	Rqd	Rqd	All LEED prerequisites are required to be met.
WE1.1	Water Efficient Landscaping: Reduce by 50%	Pref		See paragraph IRRIGATION. Project must include landscaping to be eligible for this credit.
WE1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	Pref		Project must include landscaping to be eligible for this credit.
WE2	Innovative Wastewater Technologies - OPTION 1			
WE2	Innovative Wastewater Technologies - OPTION 2			
WE3	Water Use Reduction	Pref		See paragraph BUILDING WATER USE REDUCTION.

ENERGY AND ATMOSPHERE				
EAPR1	Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR2	Minimum Energy Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EA1	Optimize Energy Performance	Rqd	1	Earning of LEED EA1 points as indicated in paragraph ENERGY CONSERVATION , as a minimum, is required..
EA2.1	On-Site Renewable Energy	Pref		See paragraph ENERGY CONSERVATION .
EA3	Enhanced Commissioning			The Commissioning Authority may be provided through the Design-Build Contractor only if in accordance with USGBC Credit Interpretation Ruling (CIR) dated 9/15/06. Commissioning Authority activities begin during design phase and continue well beyond beneficial occupancy. Assume Government will not provide CxA post-occupancy activities unless indicated otherwise.
EA4	Enhanced Refrigerant Management			
EA5	Measurement & Verification			Assume Government will not provide post-occupancy activities unless indicated otherwise.
EA6	Green Power		X	See paragraph LEED CREDITS COORDINATION for information relating to this credit.
MATERIALS AND RESOURCES				

MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Installation provides collection service and outside receptacle needs coordination.
MR1	Building Reuse			
MR2.1	Construction Waste Management: Divert 50% From Disposal	Pref		See paragraph CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
MR2.2	Construction Waste Management: Divert 75% From Disposal	Pref		
MR3	Materials Reuse			
MR4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Pref		See paragraph RECYCLED CONTENT.
MR4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Pref		
MR5.1	Regional Materials:10% Extracted, Processed & Manufactured Regionally			
MR5.2	Regional Materials:20% Extracted, Processed & Manufactured Regionally			
MR6	Rapidly Renewable Materials	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS and

				paragraph FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM.
MR7	Certified Wood	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS.
<u>INDOOR ENVIRONMENTAL QUALITY</u>				
EQPR1	Minimum IAQ Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Assume all buildings are smoke free unless indicated otherwise. Family housing, barracks and other lodging are facility types where smoking may be permitted in some cases. If Statement of Work indicates smoking is permitted in these types of facilities, the requirements of LEED-NC 2.2 Option 3 apply.
EQ1	Outdoor Air Delivery Monitoring			
EQ2	Increased Ventilation			
EQ3.1	Construction IAQ Management Plan: During Construction	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ4.1	Low Emitting Materials: Adhesives & Sealants	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.2	Low Emitting Materials: Paints & Coatings	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	Pref		See paragraph LOW-EMITTING MATERIALS.

EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ5	Indoor Chemical & Pollutant Source Control	Pref		System requiring weekly cleaning to earn this credit is not a permitted option for Army projects.
EQ6.1	Controllability of Systems: Lighting			
EQ6.2	Controllability of Systems: Thermal Comfort			
EQ7.1	Thermal Comfort: Design			
EQ7.2	Thermal Comfort: Verification			Project must earn credit EQ7.1 to be eligible for this credit. Assume Government will not provide post-occupancy activities unless indicated otherwise.
EQ8.1	Daylight & Views: Daylight 75% of Spaces	Pref		See paragraph DAYLIGHTING.
EQ8.2	Daylight & Views: Views for 90% of Spaces	Pref		
INNOVATION & DESIGN PROCESS				
IDc1.1	Innovation in Design			See paragraph INNOVATION AND DESIGN CREDITS. Assume Government will not provide any activities associated with ID credits.
IDc1.2	Innovation in Design			
IDc1.3	Innovation in Design			
IDc1.4	Innovation in Design			
IDc2	LEED Accredited Professional	Rqd	Rqd	LEED AP during design and construction is required.
REGIONAL PRIORITY CREDITS (Version 3 only)				See paragraph LEED CREDITS COORDINATION for information relating to this.

APPENDIX M

LEED OWNER'S PROJECT REQUIREMENTS



LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

USACE Southwest Region

Fort Bliss Expansion Project

Project: THAAD JLENS Sustainment Brigade TEMF

Yes D/B	Yes GOV	? D/B	? GOV	No
1	4		2	5

1	4		2	5	Sustainable Sites	14 Points
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Y					Prereq 1	Construction Activity Pollution Prevention	Required
	1				Credit 1	Site Selection	1
				1	Credit 2	Development Density & Community Connectivity	1
				1	Credit 3	Brownfield Redevelopment	1
				1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
					Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
				1	Credit 4.3	Alternative Transportation, Low-Emitting and Fuel-Efficient Vehicles	1
			1		Credit 4.4	Alternative Transportation, Parking Capacity	1
				1	Credit 5.1	Site Development, Protect or Restore Habitat	1
			1		Credit 5.2	Site Development, Maximize Open Space	1
	1				Credit 6.1	Stormwater Design, Quantity Control	1
	1				Credit 6.2	Stormwater Design, Quality Control	1
	1				Credit 7.1	Heat Island Effect, Non-Roof	1
1					Credit 7.2	Heat Island Effect, Roof	1
					Credit 8	Light Pollution Reduction	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
				2

				2	Water Efficiency	5 Points
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				1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
				1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
					Credit 2	Innovative Wastewater Technologies	1
					Credit 3.1	Water Use Reduction, 20% Reduction	1
					Credit 3.2	Water Use Reduction, 30% Reduction	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
6		4		4

6		4		4	Energy & Atmosphere	17 Points
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Y					Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Y					Prereq 2	Minimum Energy Performance	Required
Y					Prereq 3	Fundamental Refrigerant Management	Required
6		4			Credit 1	Optimize Energy Performance	1 to 10
				1	Credit 2	On-Site Renewable Energy	1 to 3
				1	Credit 3	Enhanced Commissioning	1
					Credit 4	Enhanced Refrigerant Management	1
				1	Credit 5	Measurement & Verification	1
				1	Credit 6	Green Power	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
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continued...

1				3.3	Materials & Resources	13 Points
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Y					Prereq 1	Storage & Collection of Recyclables	Required
				1	Credit 1.1	Building Reuse , Maintain 75% of Existing Walls, Floors & Roof	1
				1	Credit 1.2	Building Reuse , Maintain 100% of Existing Walls, Floors & Roof	1
				1	Credit 1.3	Building Reuse , Maintain 50% of Interior Non-Structural Elements	1
1					Credit 2.1	Construction Waste Management , Divert 50% from Disposal	1
					Credit 2.2	Construction Waste Management , Divert 75% from Disposal	1
				0.1	Credit 3.1	Materials Reuse , 5%	1
				0.1	Credit 3.2	Materials Reuse , 10%	1
					Credit 4.1	Recycled Content , 10% (post-consumer + ½ pre-consumer)	1
					Credit 4.2	Recycled Content , 20% (post-consumer + ½ pre-consumer)	1
					Credit 5.1	Regional Materials , 10% Extracted, Processed & Manufactured Regionally	1
					Credit 5.2	Regional Materials , 20% Extracted, Processed & Manufactured Regionally	1
				0.1	Credit 6	Rapidly Renewable Materials	1
					Credit 7	Certified Wood	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
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				1.5	Indoor Environmental Quality	15 Points
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Y					Prereq 1	Minimum IAQ Performance	Required
Y					Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
					Credit 1	Outdoor Air Delivery Monitoring	1
					Credit 2	Increased Ventilation	1
					Credit 3.1	Construction IAQ Management Plan , During Construction	1
					Credit 3.2	Construction IAQ Management Plan , Before Occupancy	1
					Credit 4.1	Low-Emitting Materials , Adhesives & Sealants	1
					Credit 4.2	Low-Emitting Materials , Paints & Coatings	1
					Credit 4.3	Low-Emitting Materials , Carpet Systems	1
					Credit 4.4	Low-Emitting Materials , Composite Wood & Agrifiber Products	1
				0.1	Credit 5	Indoor Chemical & Pollutant Source Control	1
				0.1	Credit 6.1	Controllability of Systems , Lighting	1
				0.1	Credit 6.2	Controllability of Systems , Thermal Comfort	1
				0.1	Credit 7.1	Thermal Comfort , Design	1
				1	Credit 7.2	Thermal Comfort , Verification	1
					Credit 8.1	Daylight & Views , Daylight 75% of Spaces	1
				0.1	Credit 8.2	Daylight & Views , Views for 90% of Spaces	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
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1					Innovation & Design Process	5 Points
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					Credit 1.1	Innovation in Design : Provide Specific Title	1
					Credit 1.2	Innovation in Design : Provide Specific Title	1
					Credit 1.3	Innovation in Design : Provide Specific Title	1
					Credit 1.4	Innovation in Design : Provide Specific Title	1
1					Credit 2	LEED® Accredited Professional	1

Yes D/B	Yes GOV	? D/B	? GOV	No GOV
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9	4	4	2	16	Project Totals (pre-certification estimates)	69 Points
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Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points

Modified LEED-NC_v2 2_checklist - THADD_JLENS_SUS_TEMF (version 1)

2 of 3

Friday, February 19, 2010

APPENDIX N
LEED Requirements for Multiple Contractor Combined Projects

Not Used

APPENDIX O
LEED Strategy Tables

Not Used

APPENDIX P

USGBC Registration of Army Projects

Typical Registration Procedure

1. Complete the online registration form (see guidance below) at the USGBC website <http://www.usgbc.org/showfile.aspx?documentid=875> and submit it online.
2. Pay the registration fee via credit card (USACE staff: credit card PR&C is funded by project design or S&A funds).
3. The USGBC will follow up with a final invoice, the LEED-online passwords and template information.
4. If you have any questions, the USGBC contact (as of October 08) is:
Courtney Yan, LEED Program Assistant
U.S. Green Building Council
202/587-7180
cyan@usgbc.org

Completing the Registration Form

BEFORE YOU BEGIN:

Create a personal account with USGBC if you do not have one.

You will need the following information:

Project name as it appears in P2 (obtain from USACE Project Manager)

Building number/physical address of project

Zip code for Installation/project location

Total gross area all buildings in project

Total construction cost for buildings only (see Project Details Section instructions below)

ACCOUNT/LOGIN INFORMATION SECTION

1. The person registering the project **must have an account with USGBC** (login and password) to complete the form. If you have an account, select "I already have a USGBC Web site account" and enter email and password (twice). If you do not have an account, you may select "Create a new USGBC website account" and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. **IMPORTANT:** USACE team members are members of USGBC and are eligible for Member prices. USACE team members registering projects should be sure to include the USACE Corporate Access ID on the form (if you do not have it contact richard.l.schneider@usace.army.mil or judith.f.milton@usace.army.mil for the number).
2. The Account/Login Information section is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

PROJECT TYPE SECTION

Self-explanatory. As of October 08 USACE projects use LEED for New Construction V2.2. USACE staff members are USGBC members.

GENERAL PROJECT INFORMATION SECTION

Project Title: Match the project name used in P2. Contact the USACE Project Manager for this information.

Is Project Confidential: Indicate NO except if project has security sensitivity (elements that are FOUO or higher security) indicate YES.

Project Address 1 and 2: This is the physical location of the project. Provide building number, street address, block number or whatever is known to best describe the location of the project on the Installation.

Project City: Installation Name

State, Country, Zip Code: Self-explanatory

How Did You Hear About LEED: USACE requirement

PRIMARY CONTACT INFORMATION

The Primary Contact may be a Contractor or a USACE staff member. USGBC considers this individual the primary point of contact for all aspects of the project. It is recommended this person be the Contractor Project Manager or the USACE Project Manager.

PROJECT OWNER INFORMATION

Project Owner First Name, Last Name, email: The Project Owner is the USACE Project Manager.

Organization Name: U.S. Army Corps of Engineers. This field **MUST** be completed this way because it will be used as a search field by higher HQ to find all USACE registered projects.

PROJECT DETAILS

Owner Type: Military Base

Project Scope: Provide brief description (example: barracks complex)

Site Conditions: Provide brief description (example: wooded with steep grades)

Occupant Type: Provide brief description (example: military and civilian employees)

Owner Occupied: No

Gross Square Footage: Provide total area all buildings in project

Project Budget: Do not include the cost for design, site work, demolition, abatement or other work – do not include Government contingency or supervision costs. For design-build and construction projects registered after award, use the awarded contract cost for construction of buildings only. For projects registered prior to award of design-build or construction contract, use the total Primary Facility cost from DD1391 or updated Primary Facility cost based on design development if available.

Current Project Phase: Identify phase at time of registration (example: design start, construction start)

Project Type: Self-explanatory

PAYMENT INFORMATION

Self-explanatory

APPENDIX Q
REV 1.1 – 31 MAY 2009
AREA COMPUTATIONS

Computation of Areas: Compute the "gross area" and "net area" of facilities (excluding family housing) in accordance with the following subparagraphs:

(1) Enclosed Spaces: The "gross area" is the sum of all floor spaces with an average clear height $\geq 6'-11"$ (as measured to the underside of the structural system) and having perimeter walls which are $\geq 4'-11"$. The area is calculated by measuring to the exterior dimensions of surfaces and walls.

(2) Half-Scope Spaces: Areas of the following spaces shall count as one-half scope when calculating "gross area":

- Balconies
- Porches
- Covered exterior loading platforms or facilities
- Covered but not enclosed passageways and walks
- Open stairways (both covered and uncovered)
- Covered ramps
- Interior corridors (Unaccompanied Enlisted Personnel Housing Only)

(3) Excluded Spaces: The following spaces shall be excluded from the "gross area" calculation:

- Crawl spaces
- Uncovered exterior loading platforms or facilities
- Exterior insulation applied to existing buildings
- Open courtyards
- Open paved terraces
- Uncovered ramps
- Uncovered stoops
- Utility tunnels and raceways
- Roof overhangs and soffits measuring less than 3'-0" from the exterior face of the building to the fascia

(4) Net Floor Area: Where required, "net area" is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall "assignable net area" is determined by subtracting the following spaces from the "gross area":

- Basements not suited as office, special mechanical, or storage space
- Elevator shafts and machinery space
- Exterior walls
- Interior partitions
- Mechanical equipment and water supply equipment space
- Permanent corridors and hallways
- Stairs and stair towers
- Janitor closets
- Electrical equipment space
- Electronic/communications equipment space

APPENDIX R

SUBMITTAL REGISTER SAMPLE PAGE

RMS SUBMITTAL REGISTER INPUT FORM			CONTRACT NUMBER		DELIVERY ORDER																				
TITLE AND LOCATION																									
Button	<-----Right click for Instructions		TYPE OF SUBMITTAL								CLASSIFICATION				REVIEWING OFFICE										
SECTION	PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	01 - PRECON SUBMITTALS	02 - SHOP DRAWINGS	03 - PRODUCT DATA	04 - SAMPLES	05 - DESIGN DATA	06 - TEST REPORTS	07 - CERTIFICATES	08 - MFRS INSTRUCTIONS	09 - MFRS FIELD REPORT	10 - O&M DATA	11 - CLOSEOUT SUBMITTALS	FO - FOR INFORMATION ONLY	GA - GOVERNMENT APPROVED	DA - DESIGNER OF RECORD APPROVAL	CR - CONFORMANCE REVIEW	DA / CR	DA / GA	DO - DISTRICT OFFICE	AO - AREA OFFICE	RO - RESIDENT OFFICE	PO - PROJECT OFFICE	DR - DESIGNER OF RECORD	AE - ARCHITECT / ENGINEER
00 72 00	52.236-13	Accident Prevention Plan	X													X				X					
00 73 00	1.11	Dev. From Accept. Design. No Deviation from Contract					X										X			X				X	
00 73 00	1.11	Dev. From Accepted Design - Deviates from Contract					X											X		X				X	
00 73 00	1.17	Supplemental Price Breakdown	X											X						X					
00 73 00	1.18	SSHO Qualifications	X												X					X					
01 10 00	5.2.3.1	(if concrete pavement) Joint Layout Plan with design drawings					X									X									
01 10 00	5.5.2	Building Envelope Sealing Performance Testing						X						X						X					
01 10 10	***	Tests as Req by Codes - DOR Develops Test Program						X						X						X				X	
01 10 00	5.8.3	BAS Review Information		X													X		X	X				X	
01 10 00	5.8.3	BAS Performance Verification Test					X							X						X				X	
01 10 00	5.8.4	Testing Adjusting and Balancing					X							X						X				X	
01 10 00	5.8.5	Commissioning					X							X						X				X	
01 10 00	6.15	Environmental As Required for Site Specific					X									X				X				X	
01 10 00	6.16	Permits as required for Site specific					X									X				X				X	
01 10 00	5.10.2	Fire Protection Tests						X	X					X						X				X	
01 32 01.00 1C	3.4.1	Preliminary Project Schedule	X												X					X					
01 32 01.00 1C	3.4.2	Initial Project Schedule	X												X					X					
01 32 01.00 1C	3.4.3	Design Package Schedule	X												X					X					
01 32 01.00 1C	3.6.1	Periodic schedule updates from the Contractor	X												X					X					
01 32 01.00 1C	3.7	Time Extension Request (Schedule)	X												X					X					
01 33 00	1.8	Submittal Register - DOR Input Required	X											X						X				X	
01 33 00	1.8	Submittal Register Updates (Design Packages, etc.)	X											X						X				X	
01 33 00	1.3.1	Substitution of Manuf or Model Named in Proposal		X	X												X			X				X	
01 33 16	1.2	Identify Designer(s) of Record	X											X						X					
01 33 16	1.1.2 / 3.2.4	Fast Track Design Package(s)					X									X				X					
01 33 16	1.2	Identification of all Designers of Record	X													X				X					
01 33 16	3.2.1	Site and Utility Design Package, incl. Substantiation					X									X				X					
01 33 16	3.2.2/3.5	Interim Design Submittal Package(s), incl. Substantiation					X									X				X					
01 33 16	3.5.1	Drawings					X									X				X					
01 33 16	3.5.2.2	Sitework Design Analyses					X									X				X					
01 33 16	3.5.2.3	Structural Design Analyses					X									X				X					
01 33 16	3.5.2.4	Security Design Analyses					X									X				X					
01 33 16	3.5.2.5	Architectural Design Analyses					X									X				X					
01 33 16	3.5.2.6	Mechanical Design Analyses					X									X				X					
01 33 16	3.5.2.7	Life Safety Design Analyses					X									X				X					
01 33 16	3.5.2.8	Plumbing Design Analyses					X									X				X					
01 33 16	3.5.2.9	Elevator Design Analyses (as Applicable)					X									X				X					
01 33 16	3.5.2.10	Electrical Design Analyses					X									X				X					
01 33 16	3.5.2.11	Telecommunications Design Analyses					X									X				X					
01 33 16	3.5.2.12	Cathodic Protection Design Analyses					X									X				X					
01 33 16	3.5.3	Geotechnical Investigations and Reports					X									X				X					
01 33 16	3.5.4	LEED Submittals					X									X				X					
01 33 16	3.5.5	Energy Conservation Documentation					X									X				X					
01 33 16	3.5.6	Specifications					X									X				X					
01 33 16	3.5.7	Building Rendering					X									X				X					
01 33 16	3.2.4/3.7	Final Design Submittal Package(s), incl. Substantiation					X									X				X					
01 33 16	3.7.5	DD Form 1354 (Transfer of Real Property)										X				X				X					
01 33 16	3.2.5/3.8	Design Complete Submittal Package(s)					X									X				X					
01 33 16	3.3.3	Design and Code Review Checklists					X									X				X					
01 33 16	A-2.0	SID - Interim and Final (as applicable)			X	X	X								X					X					
01 33 16	B-2.0	FFE (as Applicable)					X								X					X					
01 45 04.00 1C	3.2	Design and Construction QC Plan	X													X				X					
01 57 20.00 10	1.2	Environmental Protection Plan	X													X				X					
01 78 02.00 1C	1.2.1	Final as-Built Drawings											X		X					X					
01 78 02.00 1C	1.2.7	Provide final as-built CADD and BIM Model files											X		X					X					
01 78 02.00 1C	1.2.9	Provide scans of all other docs in Adobe.pdf format											X		X					X					
01 78 02.00 1C	1.3.1	Equip-in-Place list of all installed equip and cost											X		X					X					
01 78 02.00 1C	1.3.2	Data on equip not addressed in O&M manuals											X		X					X					
01 78 02.00 1C	1.3.3	Final as-built specs - electronic files											X		X					X					
01 78 02.00 1C	1.4.2.1	Warranty management plan - FAR 52.246-21											X		X					X					
01 78 02.00 1C	1.4.2.1	Certificates of Warranty for extended warranty items											X		X					X					
01 78 02.00 1C	1.4.2.1	Contractor's POCs for implementing warranty process											X		X					X					
01 78 02.00 1C	1.4.2.1	List of each warranted equip, item, feature or system											X		X					X					
01 78 02.00 1C	1.5	See also Section 01 10 00 par. 5.8.4 and 5.8.5											X		X					X					
01 78 02.00 10	1.6.1.2	Equipment O&M Manuals - 1 electronic / 2 hard copies											X		X					X					
01 78 02.00 10	1.7	Field Training DVD Videos									X			X						X					
01 78 02.00 10	1.8	Pricing of CF/CI and GF/CI Property											X		X					X					
01 78 02.00 1C	1.11	List of Completed Cleanup Items											X				X			X					

APPENDIX AA

FORT BLISS IDG EXCERPTS

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4.1.3 Environmental Setting

The arid southwest ecoregion is comprised of essentially two provinces, the Chihuahuan Desert Province and the American Semi-desert and Desert Province (Fig. 4.4). Both provinces share similar climatic conditions of extreme aridity as well as extremely high air and soil temperatures, which are characteristics of tropical/subtropical deserts. Direct sun radiation is strong, as is outgoing radiation at night, causing extreme variations between night and day temperatures (35–45° F), and rare nocturnal frosts. Annual precipitation is typically less than 9 inches and vegetation is xeriphytic, widely dispersed and providing negligible groundcover. Many annual species are present but only appear with heavy rains that saturate the soil. The dominant soil formation process is salinization, which produces areas of salt crust. Calcification also occurs in well-drained uplands and forms caliche (calcium carbonate) layers at soil depths of at least 12 inches below the surface. Humus in the soil is lacking (except along riparian areas) and soils are mostly Aridisols (soils formed in very dry conditions) and dry Entisols (recently developed soils).

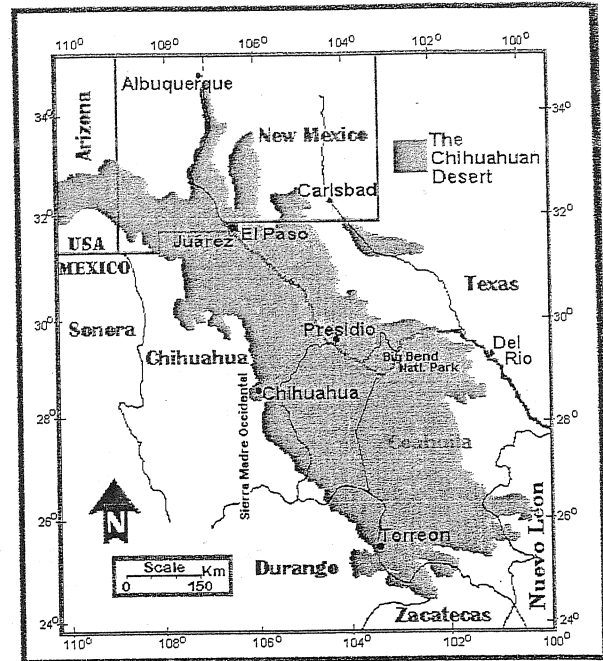


Fig. 4.4 - Chihuahuan Desert (map from UTEP website)

4.1.3.1 Topography

Fort Bliss is located partially within the Chihuahuan Desert Province and the American Semi-desert and Desert Province of the southwest region of the United States. The Chihuahuan Desert consists of southeastern Arizona, southern New Mexico and western Texas, encompassing approximately 85,200 square miles. The high desert consists of undulating plains, elevations near 4,000 feet and isolated mountains rising 2,000 to 5,000 feet. The American Semi-desert and Desert Province consists of southwestern California, southwestern Arizona, and southern Nevada and includes the Mojave, Colorado, and Sonoran deserts. (87,700 sq. mi.) The topography is characterized by gently undulating plains, isolated mountains, and buttes. Elevations range from 280 feet below sea level to 4,000 feet in valleys and basins. Some mountain ranges reach as high as 11,000 feet. Most of the province drains to the sea via dry washes or through underground seepage. The Colorado River is the largest and principal river through the province.

4.1.3.2 Geology

The Rio Grande Drainage Basin's geologic history generally ranges from Precambrian to late Cretaceous. During this time, the area experienced folding, broad regional uplifting, and inundations by continental seas. The current topography in the area reflects Cenozoic structural deformation.

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Fault patterns in the area indicate that extension in the southwestern United States was the result of both broad regional uplift and differential drift within the North American Plate. These forces combined to form a physiographic province characterized by dropped basins (called grabens) bounded by tilted fault block ridges (called horsts). More simply stated, grabens and horsts are formed when rock layers move upward along a fault line creating a ridge (horsts) and/or rock layers subside along a fault line creating a basin (graben). A structural trough was created by mid-Tertiary high-angle extension faults running north south in front of the Franklin Mountains (Fig. 4.5). This represents both the approximate combined throw along two identified fault planes and the subsequent thickest Hueco bolson unconsolidated fill deposits.

Minor faulting continues in the area affecting Pleistocene and early Holocene bolson deposits. Evidence of the faulting is seen in the fault-scarp of the alluvial fan (created by sediments carried down from the mountains in a fan shape) that parallels the bedrock front of the Franklin Mountains. Movement along this fault was normal, with the basinward blocks subsiding approximately 200-300 feet relative to the mountain front. Smaller displacement faults (trending north-south) extend eastward across the Hueco bolson. These faults cut bolson deposits, Holocene alluviums, Pleistocene gravels, and the subsurface caliche layer. These Quaternary faults may uplift/basin-subsidence episodes. The proximity of the area to the eastern edge of the Rio Grande Rift Zone accounts for the extensive presence of various volcanic dikes and sills that crosscut existing structures.

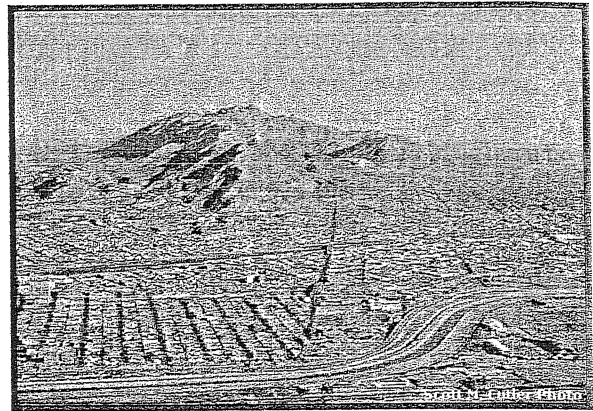


Fig. 4.5 - Franklin Mountains

4.1.3.3 Soils

Soils are mostly aridisols in the western and northern portions of the province. Entisols and aridisols are found in the southern areas of the province. Alkaline conditions are present and salt crusting at the surface and caliche below the surface are typical. Soils are shallow and well drained, and gravelly or sandy in texture. Primary soil type is aridisols but entisols occur on older alluvial fans and terraces. Gravel or bare rock covers much of the ground near the bases of some mountains due to strong desert rainstorms that allow little soil development to occur.

4.1.3.4 Climate

Climate within the Chihuahuan Desert is distinctly arid with long hot summers, brief cold winters and occasional hard freezes (mean temp. 10-20°F). There are approximately 230-245 frost-free days but freezes are common and can last up to 72 hours. Spring and early summer are extremely dry; three quarters of the rainfall comes in summer monsoons, the rest as gentle rains in winter. Eight inches of rain falls in the desert and up to 20 inches in the mountains. Severe droughts occur about every 20 years have been recorded since 1890's.

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7.5.3.1 Hot Arid Regions. Design and site development to minimize solar heat gain and maximize shade and encourage humidity in outdoor spaces (Fig. 7.5).

7.5.4 Views and Vistas. The installation will be designed to preserve and enhance scenic and other attractive views and vistas, and to screen unattractive views and vistas. Visual extensions through open spaces provide a sense of orientation, relief, and enjoyment.

7.5.5 Vegetation. The installation will be designed to protect and preserve existing native vegetation. This preservation reduces maintenance and enhances sustainability. A preferred plant matrix (Appendix O, Plant Palette) is included in this Installation Design Guide. (Also, see Section 10 – Landscape Design Component).

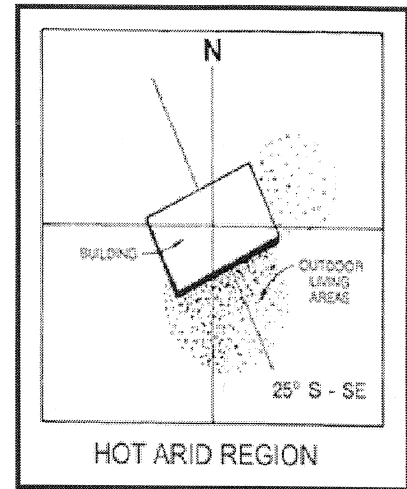


Fig. 7.5 – Building Orientation Minimizes Solar Heat Gain

7.6 MANMADE SITE CONDITIONS

7.6.1 The site plan provides the locations of the manmade development that will occur on site. It establishes the spatial relationships as well as the relationships between manmade and existing natural features. Manmade site conditions include all development on the installation to include buildings, roadways, parking lots, walkways, walls, fences, utilities, and other facilities. Buildings, roadways, parking lots and above ground utilities are the primary manmade visual determinants.

7.6.2 The following site planning guidelines will be used in the visual and spatial review of the installation:

7.6.2.1 Cluster buildings to reduce impact on the natural environment, and reduce roadways and utility corridors needed to serve the development; at the same time, give full consideration to antiterrorism and force protection requirements.

7.6.2.2 Locate large buildings in relatively flat areas to reduce cut and fill, preserve natural vegetation and drainage, and orient to topography (Fig. 7.6).

7.6.2.3 Minimize solar heat gain for cooling.

7.6.2.4 Site buildings with consideration for the microclimate conditions of the site that result in variances in wind or light because of adjacent land forms, structures, or trees.

7.6.2.5 Orient outdoor pedestrian areas for most comfortable exposure.

7.6.2.6 Utilize lighter colored building surfaces exposed to the sun and darker colors on recessed surfaces to absorb radiation.

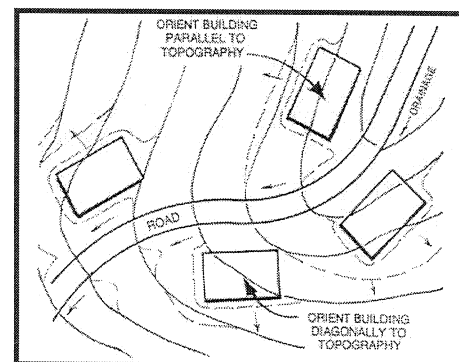


Fig. 7.6 - Orient Buildings and Roads to Topography

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- 7.6.2.7 Orient windows according to impact of climatic conditions.
- 7.6.2.8 Locate development on leeward side of hills.
- 7.6.2.9 Design and locate roads to provide a hierarchy of traffic carrying capacities.
- 7.6.2.10 Locate roads to blend with topography and vegetation.
- 7.6.2.11 Design and locate parking lots to minimize visual impact of broad expanses of pavement and vehicles.
- 7.6.2.12 Design and locate pedestrian walkways and bicycle paths to fit the physical environment; and, provide a comfortable pedestrian experience, limiting conflicts with vehicular traffic.
- 7.6.2.13 Locate trees and shrubs to buffer harsh natural conditions (Fig. 7.7).
- 7.6.2.14 Deciduous material allows for sun in the winter and provides shade in the summer. Evergreen material provides windbreaks for cold north winds.
- 7.6.2.15 Design and locate site elements to blend with and enhance the physical environmental.
- 7.6.2.16 Force Protection requirements should be designed and located to blend with the physical environment.

7.7 SPECIFIC SITE PLANNING CONSIDERATIONS

7.7.1 Site planning considerations must adhere to the physical historic context, or setting, of a historic district. The setting of a historic district is the area or environment in which a historic property is found. The elements of setting, such as the relationship of buildings to each other, setbacks, views, driveways and walkways, and street trees collectively create the character of a district. In instances, such as at Fort Bliss, buildings themselves form a neighborhood or setting that create the character of the district.

New site planning and new construction in Fort Bliss historic districts or in a historic district's view shed shall be physically compatible with the visual and spatial character of the historic district. Site planning considerations shall take into account the historical planning of the installation. This includes: location and orientation of buildings, spaces between

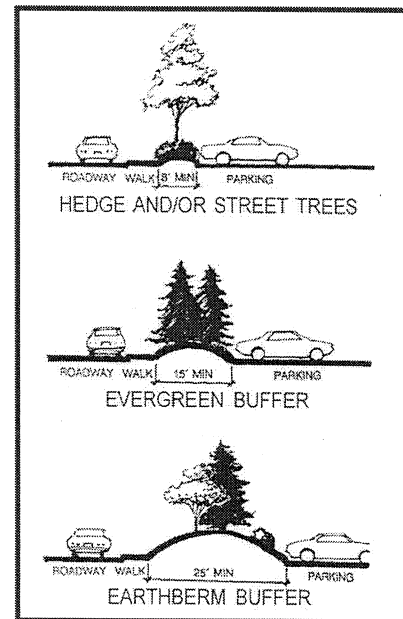


Fig. 7.7 - Screen Parking Areas

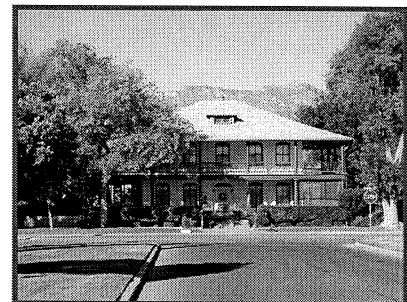


Fig. 7.8 - Pershing House – Historic District

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SECTION 8 BUILDINGS DESIGN STANDARDS

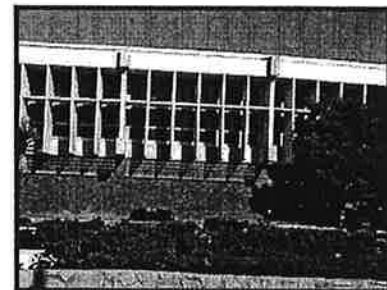
8.1 INTRODUCTION

8.1.1 The design character of an installation's buildings affects the installation's overall image. The visual analysis of buildings and related structures helps define visual zones and themes and is an important part of an installation's assets and liabilities assessment.

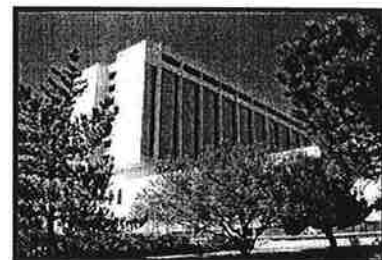
8.1.2 The building design component encompasses the character of the buildings as well as the arrangement of buildings relative to one another and to their environment. In general, use architectural style, materials, and colors indigenous to the region. The preservation of historically and culturally significant structures adds to an installation's character and provides the sense of a heritage.

8.1.3 The visual analysis of structures also includes concerns for accessibility, use of materials, placement of entrances, incorporation of additions and renovations, the incorporation of plazas and courtyards, interior design and the appropriateness and quality of building maintenance.

8.1.4 This section provides the objectives and visual determinants that should be utilized to identify and assess the building design quality of the installation. The section also provides standards and guidance pertaining to the development and maintenance of the various interiors and exteriors of buildings on the installation.



**Fig. 8.1 – Architectural Detail
of USASMA Building**



**Fig. 8.2 – The Medical Center
Main Building**

8.2 BUILDING OBJECTIVES

8.2.1 Sustainability. The architectural style of existing and future buildings should reflect and reinforce the sustainability of the installation. Sustainable design reduces construction and maintenance cost and conserves energy through proper construction and materials selection. See [Appendix D](#) for a

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more complete discussion on Sustainable Design.

8.2.2 Building Design Objectives:

8.2.2.1 Adapt building designs to natural site conditions (Fig. 8.3).

8.2.2.2 Design buildings in clusters to preserve land and reduce construction and maintenance costs.

8.2.2.3 Develop a coherent architectural style that results in the blending of new and old structures. However, when considering historical buildings, one should be able to differentiate between the historic fabric and the new material.

8.2.2.4 Design buildings to include more floors in a vertical structure that results in a smaller footprint and more efficiently utilizes limited installation land areas.

8.2.2.5 Combine multiple activities in one building to reduce the number of buildings required and more efficiently utilize limited installation land areas.

8.2.2.6 Design multiple use facilities with the capability to quickly change interior layouts to accommodate changing requirements.

8.2.2.7 Use indigenous construction materials and practices that require less energy to produce and transport and may be recycled at the end of their usefulness.

8.2.2.8 Locate windows to maximize natural light, ventilation and outward views.

- a) All windows and other glazed areas exposed to the sun, including all glass within 20 degrees east or west of true south, shall be completely shaded on the exterior no less than 50 percent of the time between 0900 and 1730 (solar time) daily during the period from 30 April through 1 October. Partial shading all the time is an acceptable alternative provided the total solar gain does not exceed the amount permitted above, based on actual solar studies. Shading may be achieved by building projections (either horizontal or vertical), by a deep reveal, or any combination of these measures or other architectural design.
- b) True South: Magnetic declination for Fort Bliss is 12 degrees east; that is, a compass reads 12 degrees east of True North or 12 degrees west of True South.
- c) Optimum Direct Gain Aperture Range (percent range of glazed opening to floor area): 11.6 percent.
- d) Minimum profile angle for fixed shade design (may declination): 65.5 degrees.
- e) Recommended shade devices (East and West): Trees and shrubs.

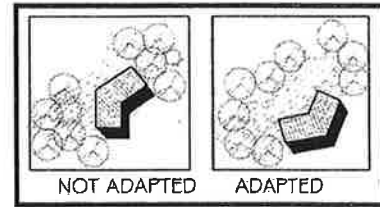


Fig. 8.3 - Adapt Building Design To Site Conditions

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- f) Optimum orientation of facility for passive solar and topo conditions: Within 20 degrees east or west of True South.

8.2.2.9 Consider adaptive reuse of buildings once their initial use is no longer required.

8.3 STRUCTURAL CHARACTER

8.3.1 The character of installation architecture varies according to the use of the structure and when it was built. This use and age variation can result in character incompatibilities.

8.3.2 The difference in character may also result when the designer ignores the character and scale of adjacent buildings or uses an imitative technique unsuccessfully.

8.3.3 The coordination of structural character on an installation provides a consistent and coherent “sense of order” and “sense of place”. This relationship of design comes from using compatible scales, massing, form, color, texture, materials, and fenestration. These design techniques can be utilized in the visual review and analysis of the installation. They are further explained below:

8.3.3.1 Scale. Scale refers to the size of a building facade in relation to humans. Buildings that include predominant vertical facades, which dwarf the individual, are defined as monumental in scale. Buildings with more horizontal facades designed to relate more to the size of the human figure are defined as human scale (Fig. 8.4). The scale of most buildings on installations should be more human than monumental. All new construction should be compatible in scale with adjacent buildings. Monumental architectural design is typically utilized for more ceremonial buildings, such as worship centers, headquarters complexes, and hotel facilities. These buildings make use of large, glazed areas at entrances and oversized fenestration elements to create a scale appropriate to the building’s use. Scale and relief should be provided through roof form, fenestration, building articulation and landscape plantings.

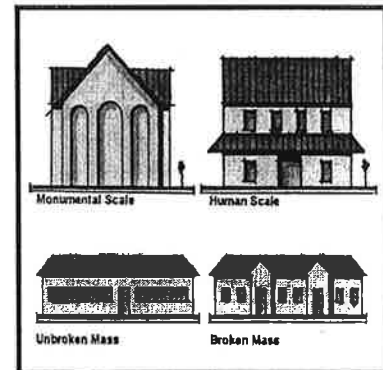


Fig. 8.4 - Structure Scale and Massing

8.3.3.2 Massing. Massing refers to the overall bulk or volume of a building or buildings (Fig. 8.4). The size and proportion of the individual buildings in a grouping of buildings should be designed to be proportionally compatible with the adjacent structures.

8.3.3.3 Form. The form of a building is determined by its size, mass, shape and proportions. The use of similar building forms provides continuity to the installation architectural image.

8.3.3.4 Color. The use of a color scheme that is consistent throughout the installation, where possible, results in a continuity of buildings and contributes to a sense of place



Fig. 8.5 - Color and Form Contribute to a Sense of Place.

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(Fig. 8.5). However, color schemes throughout the installation often vary according to the visual zone and visual theme in which the structure is located.

8.3.3.5 Texture. The use of building materials of similar texture provides visual continuity for the installation.

8.3.3.6 Materials. The use of similar building exterior finish and trim materials provides visual continuity.

8.3.3.7 Fenestration. Building fenestration includes features such as doors, windows, and decorative details. These features should be similar in arrangement, design, size, and proportion for architectural compatibility and visual consistency (Fig. 8.6).

8.3.3.7.1 Discourage Bird Habitat. When designing new construction, consider the use of design components that discourage birds from nesting on buildings. Birds and bird droppings are a nuisance, damaging to buildings and unhealthy to the human work environment. The following architectural features are attractive to birds and should not be used unless proper measures are taken to discourage their attractiveness to birds:

- Deep, uninhabited porches
- Flat architectural relief that projects from buildings or structures at least 4 inches
- Deep window sills
- Exposed gutters
- Flat and accessible areas under open stairs
- HVAC equipment that provide a water source for birds

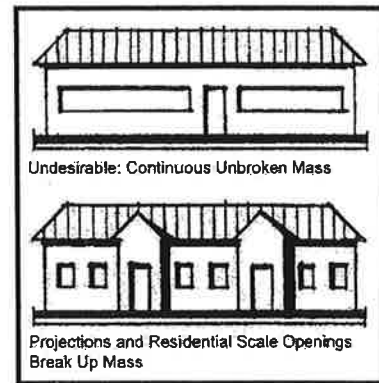


Fig. 8.6 - Fenestration Breaks Up Mass.

8.4 BUILDING ENTRANCES

8.4.1 The building entrance is a primary feature of any building design. It should be defined and recognizable as the point of entry regardless of the size or importance of the building (Fig. 8.7).

8.4.2 The entrance to a building should be in a prominent location and should be oriented toward the primary adjacent public spaces such as a courtyard, lawn, parking lot, or street.

8.4.3 The details of an entrance should be designed to

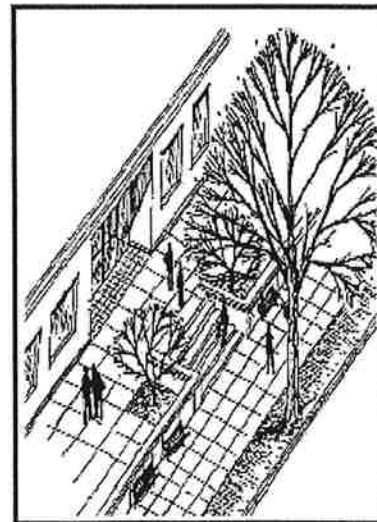


Fig. 8.7 - Entrance is Positive Visual Experience

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provide continuity with other entrances to the building and the entrances of adjacent buildings.

8.5 SERVICE AREAS

8.5.1 Service areas, such as loading docks and trash dumpsters, should be screened from the views of primary use areas such as entrances, courtyards, gathering areas, streets, and parking lots.

8.5.2 Service areas should be enclosed by masonry or rock walls. Screen walls should be between six and eight feet high and should be in harmony with the adjacent building.

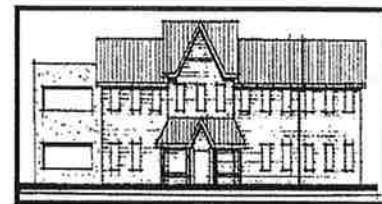
(Fig. 8.8)

8.5.3 Trash and garbage collection areas must be located a minimum of 25 meters (82 feet) from troop billeting, family housing areas (containing more than 12 units), and stand-alone retail facilities (UFC 4-010-01, Table B-1).

8.6 NOT USED



Fig. 8.8 – Screened Loading Dock



Not This This
Fig. 8.10 – Renovation/ Additions
should be Compatible.

8.7 NOT USED

8.8 INDIGENOUS STRUCTURES

Sustainability in the design and construction of buildings includes incorporating time-proven building designs that are indigenous to the region. Indigenous design elements should be utilized in the design of new buildings (Fig. 8.11).



Fig. 8.11 – Building with Stucco Finish

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8.14.1.2 Use the following guidelines when selecting exterior building materials.

8.14.1.2.1 Choose materials for their longevity and maintenance characteristics.

8.14.1.2.2 Use materials with integral colors - avoid painting exterior colors.

8.14.1.2.3 Use installation standard colors for exterior walls. Add accent colors sparingly. Accent colors can be used in recesses and to accent certain portions of a buildings façade.



Fig. 8.21 – The Medical Center
at WBAMC

8.14.1.2.4 Exposed exterior materials shall not require periodic repainting. Preferred materials are factory prefinished, integrally colored, or have similarly intrinsic weathering finishes. Ferrous metals shall not be exposed to the weather unless prefinished with a protective coating that has a minimum 20-year warranty.

8.14.1.2.5 Use dark bronze anodized aluminum for exterior windows. Use dark bronze anodized aluminum storefront doors for Main Entrance doors.

8.14.1.2.6 ~~Use blended colors, T-lock type, on shingle pitched roofs;~~ fully adhered white 45 mil chlorosulfonated polyethylene (CSPE) or 60 mil Thermo Plastic Olefin (TPO), ¼" to 12" slope for "flat" roofs.

8.14.1.2.7 If a stucco look is desired, more durable materials such as EIFS or stucco-like finish on prefabricated metal panels or concrete panels shall be used. If EIFS is used a heavy duty reinforcing mesh shall be used around all doors and window openings, and extend a minimum 8'0" above finished floor elevation on all exterior walls. The heavy duty reinforcing mesh used on the EIFS shall have a minimum combined weight of 20 ounces per square yard and this standard can be met by using two layers. Use high impact mesh on all other surfaces.

8.14.1.2.8 NOT USED

8.14.1.2.9 Metal, wood, or vinyl siding should not be used. Vinyl or wood trim should not be used.

8.14.1.2.10 Satellite dishes, whether roof mounted or ground mounted, are not allowed. This requirement does not apply to Family Housing, nor to McGregor Range.

8.14.1.2.11 Not Used.

8.14.2 Appendix K, Exterior Materials Charts list the building materials applicable to the visual zones listed. – Under Development

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8.14.3 Exterior Building Color

8.14.3.1 Color charts have been developed for specific geographical areas giving consideration to climate, geography, culture, facility function, historical context, architectural character, etc. Color changes will be implemented during normally scheduled paint cycles (see [Appendix L, Exterior Color Charts – Under Development](#)).



Fig. 8.22 - The Geographical Areas for Exterior Colors.

8.14.3.2 Color is closely linked to the appropriate selection of exterior building materials and is a critical design element in relating adjacent buildings and creating a compatible visual environment within an installation.

8.14.3.3 Overhead doors color shall be light beige or white.

8.14.3.4 Historic Buildings. Repaint the building or structure to match the existing colors or colors that can be documented to have been used on that building.

8.15 KEY FACILITY TYPES STANDARDIZATION

8.15.1 The Assistant Chief of Staff for Installation Management (ACSIM) establishes Army facility standards and approves deviations from the standards.

8.15.2 Residential Communities Initiative

8.15.2.1 The intent of the Residential Communities Initiative (RCI) is to improve the housing for military families by providing quality housing in attractive neighborhoods.

8.15.2.2 The Military Housing Privatization Initiative (MHPI) legislation allows developers to build and renovate housing to local standards. In those areas where local standards do not meet the quality of life requirements of soldiers, the Community Development and Management Plan (CDMP) process allows a negotiated determination of those standards. To ensure a uniform level of quality throughout RCI, Headquarters, Department of the Army has developed new construction and renovation standards for RCI family housing to be used as reference points during CDMP preparation. These standards are routinely updated. Revisions apply to CDMP collaboration contracts awarded within specific time frames and are not retroactive to previous projects.

8.15.2.3 All RCI projects planned or under design will meet the "Gold" SPiRiT rating (as of 18 March 2003). See [Assistant Secretary of the Army Memorandum Subject: Sustainable Design and Development Requirements, dated 18 March 2003](#).

8.15.3 Not Used

8.15.5 Army Lodging.

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SECTION 10

LANDSCAPE DESIGN STANDARDS

10.1 INTRODUCTION

10.1.1 The Landscape Design Standards includes selection, placement, and maintenance of plant material on the installation. Landscape plantings provide a simple and cost effective enhancement to the general appearance of the installation.

10.1.2 The visual image conveyed by a military installation is defined not just by architectural character and site organization, but also by an attractive, organized landscape design. The presence of plant material on the installation greatly enhances the visual character and environmental quality of the installation.

10.1.3 Plantings add an element of human scale to open spaces and can be used functionally to screen undesirable views, buffer winds, reinforce the hierarchy of the circulation system, or provide a visual transition between dissimilar land uses.

10.2 LANDSCAPE OBJECTIVES

10.2.1 The overall objective of the use of plant material within the installation is to improve the physical and psychological well being of the people who live and work on the installation. This is achieved through the following objectives:

10.2.1.1 Preserve and enhance natural desert terrain where applicable.

10.2.1.2 Because trees are the largest and most visible vertical elements in the landscape, the most benefit to the appearance and physical environment of the Fort Bliss is achieved through the addition of trees. Trees must be the primary element and type of plant material in the Fort Bliss landscape to conserve water and minimize maintenance. Use shrubs and ground cover primarily as accent elements to delineate building entrances and special outdoor spaces such as plazas and patios, and at vehicular entryways.



Fig. 10.1 -Use Locally Adapted Plants to Improve Visual Quality

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Improve the overall visual quality of the installation through the use of native or locally adapted plant material to (Fig. 10.1):

- 10.2.1.2.1 Blend built environment with the natural environment.
- 10.2.1.2.2 Provide scale and comfort to pedestrian environments (Fig. 10.2).
- 10.2.1.2.3 Reinforce the hierarchy of the circulation system (Fig. 10.3).
- 10.2.1.2.4 Screen unsightly views or elements.
- 10.2.1.2.5 Buffer incompatible land uses.
- 10.2.1.2.6 Minimize maintenance through the use of native plant materials that require less maintenance to survive.
- 10.2.1.2.7 Enhance antiterrorism capabilities.



Fig. 10.2 – Provide Comfort to Pedestrians



Fig. 10.3 - Landscaping Reinforces Circulation Hierarchy.

10.3 PRINCIPLES OF LANDSCAPE DEVELOPMENT

10.3.1 Landscape design is based on the following principles.

10.3.1.1 **Unity.** The selection and placement of plant material can blend, screen, and soften incompatible architectural or other unattractive visual impacts. Plant material as a unifying element can be placed in front of a building or view to frame and enhance the visual impact.

10.3.1.2 **Balance.** Except in some historic areas, informal planting designs which utilize masses of plant materials rather than rows and hedges are most desirable. Not only do such designs offer more visual interest, but, generally, they require less maintenance. Also in an informal design, when one or a few plants die, the design intent is less likely to be lost than in a formal design.

10.3.1.3 **Contrast.** Plant material can be selected and placed to provide differences in size and shape that add interest to the environment. Plants can be located to provide a backdrop for other plants such as by placing a hedge behind a bed of annuals or perennials.

10.3.1.4 **Rhythm.** Repetition of a single plant or a mass of plants provides visual interest and formality to the landscape. Rhythm

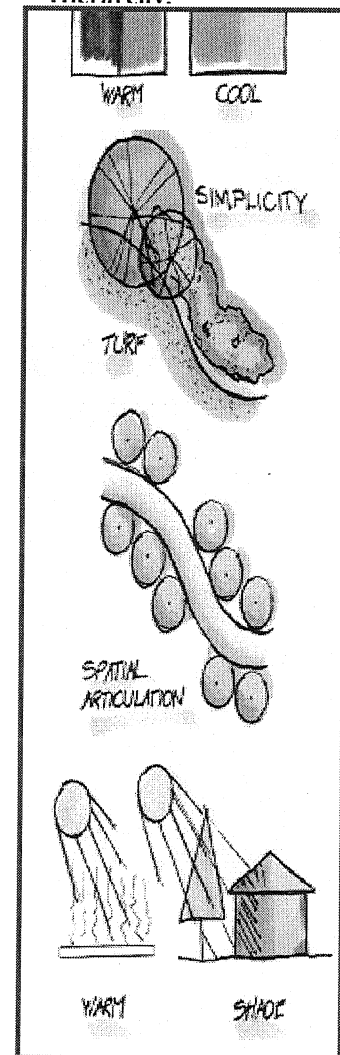


Fig. 10.4 - Principles of Design

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produces emphasis and unity and is especially effective in articulating main circulation routes.

10.3.1.5 Color and Texture. Plants can be selected and placed to provide visual interest according to their color and texture. Colors are classified as either warm (red, orange, yellow) or cool (violet, blue, green). Texture is classified as either coarse or fine.

10.3.1.6 Simplicity. Landscape plans should be broad and simple in form to limit excessive maintenance. Plants usually look better and achieve more impact when massed than when used alone. When groups of seven or less plants are used, odd numbers of plants make the most pleasing masses. Groups or clusters of plant materials should also be visually connected to successfully delineate space. Overspacing causes the composition to appear disjointed and is likely to increase maintenance.

10.3.1.7 Ultimate Effect. The landscape plan should be prepared with consideration for the mature size of all plants. The spacing of all material should utilize nursery industrial standards for mature material to account for spread as well as height. The ultimate height of the material should also be considered in relation to windows and other visual concerns.

10.3.1.8 Spatial Articulation. Plants can be selected and placed to create enclosed spaces or to separate spaces from one another. They can also be used to direct people by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement is dependent upon the density, form, and type of plants used.

10.4 SUSTAINABLE LANDSCAPE DEVELOPMENT

10.4.1 The use of plant material on the installation promotes the sustainability. Trees, shrubs, groundcover, and vines provide aesthetic appeal, energy conservation, climate modification, erosion control, air purification, wind/dust mitigation, reduction of glare and noise abatement (Fig. 10.5).

10.5 LANDSCAPE DESIGN GUIDELINES

10.5.1 Proposed plantings must be reviewed to ensure that site conditions (soil, topography, adjacent uses, and architecture) and climatic criteria (sun, shade, and moisture requirements) are considered in the desired plant design and selection (i.e., form, texture, color, size). The uses and users of the site must also be considered. Landscape planting plans should be approved by qualified personnel to provide quality assurance and promote design consistency within each visual zone.

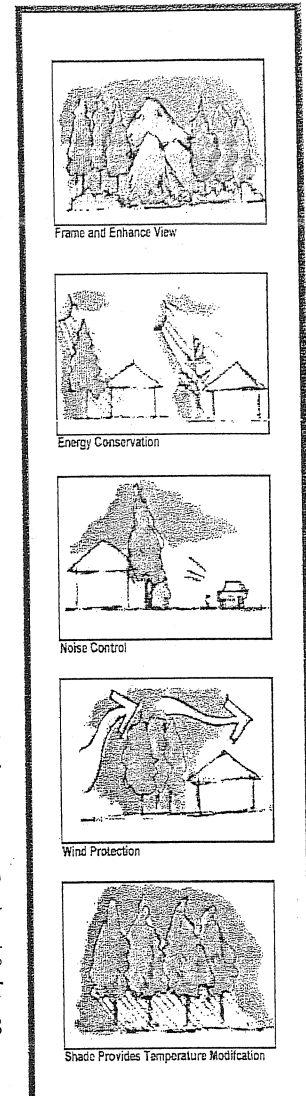


Fig. 10.5 - Plant Material Promotes Sustainability

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February 2009

10.5.2 The following paragraphs present landscaping guidelines for the various locations of plant material use.

10.5.2.1 **Foundation Planting.** To conserve water and minimize maintenance, trees must be the primary element and type of plant material in the Fort Bliss landscape. Because trees are the largest and most visible vertical elements in the landscape, the most benefit to the appearance and physical environment of the post is achieved through the addition of trees (Fig. 10.6).

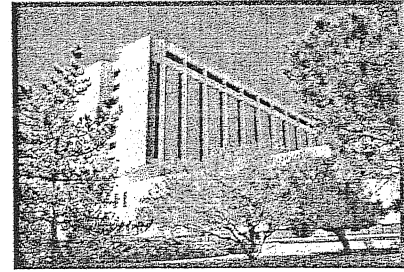


Fig. 10.6 – The Medical Center at WBAMC

10.5.2.1.1 Focal and seasonal plantings should be located at building entries for pedestrian interest.

10.5.2.1.2 Use the architecture of the building to evaluate the planting design and selection of plants.

10.5.2.1.3 Plant materials should not block windows and views from interior spaces.

10.5.2.1.4 Trees shall be set back from the building walls to provide space for mature growth and to prevent root systems from damaging the foundation.

10.5.2.1.5 Except in some historic areas, informal planting designs which utilize masses of plant materials rather than rows are most desirable.

10.5.2.1.6 Due to the possibility of insect problems (bee stings, etc.), do not plant flowering plants near entrances.

10.5.2.2 Screening.

10.5.2.2.1 **Windscreens.** Measures to mitigate high winds and blowing dust must be considered for very large open areas such as parking lots, perimeter open space areas and recreational areas. Plant materials can be used for wind control by breaking, directing or filtering the wind. Use a combination of evergreen and deciduous trees to provide windbreak protection from prevailing winds. Windbreak plantings should be irregular in form, rather than straight and evenly spaced, in order to provide more effective wind control and to visually blend with the natural character of the installation.

10.5.2.2.2 Not Used.

10.5.2.3 **Buffer Planting.** Use a mixture of evergreen and deciduous trees and shrubs to visually separate land uses and to help separate visual zones or to screen unpleasant views or noises (Fig. 10.7).

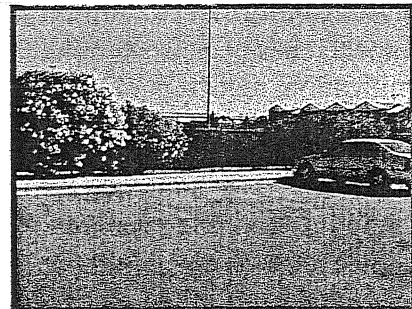


Fig. 10.7 – Buffer Planting

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February 2009

10.5.2.4 Open Space Planting / Natural Recovery Areas. The preservation and enhancement of existing landscape is encouraged (Fig. 10.8).

A program directed to allow natural recovery in almost 100 large open areas on Fort Bliss is ongoing (Fig. 10.9). The main objective is to suppress dust emissions from these areas during wind events that are common in the region. Dust is a nuisance for people in many ways: it increases the need for cleaning inside homes and working spaces, creates accumulation of soil around buildings and against walls, and commonly produces a safety risk factor as visibility is greatly reduced for motorists (Fig. 10.10).

There are more than 40 locally adapted plants that are able to get established naturally in open soil, including native and exotic species, which can live with natural rainfall. This eliminates the need for maintenance.

The following is a list of recommended actions to promote both natural vegetation recovery and aesthetics in these open areas. This approach is applicable to any open areas where the soil has been disturbed.

Initial preparations. Level soil to desired grade, leaving a rough surface so it traps seeds and retains moisture. Do not disturb ground except to conduct the maintenance described below. Soils left alone, even without vegetation, produce less dust than disturbed surfaces.

Year 1 and 2. Conduct bush-hogging at 8 inches in August and November to cut off the tops of taller vegetation and protect low-growing plants. This will allow them to grow and produce new seeds. Any undesirable tumbleweeds that proliferate during this period will be gradually outcompeted by other native vegetation and can be controlled by bush-hogging.

Year 3. If tumbleweeds are still present, mow at 8 inches in August and November. If these plants are nearly absent, mowing may be optional to improve area appearance. Do not mow less than 6 inches high.

Year 4 and on. Areas may be left undisturbed to protect vegetation cover and soil. Dust emissions should be greatly reduced or eliminated by this time. To improve appearance in highly visible areas mowing to 6 inches may be conducted in June or November.

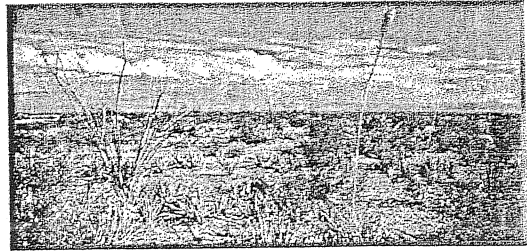


Fig. 10.8 – Desert Vegetation



Fig. 10.9 - Natural Recovery Area

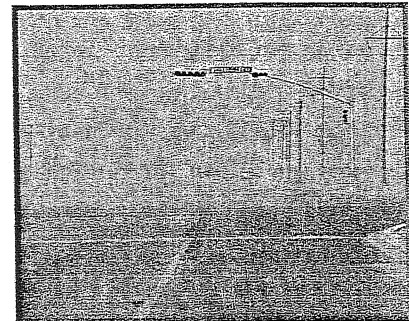


Fig. 10.10 – Dust Problem

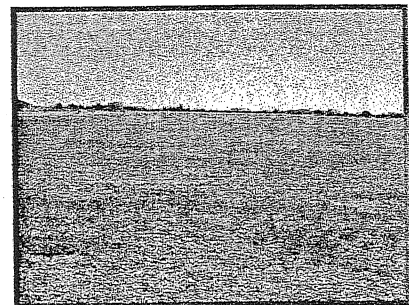


Fig. 10.11 - Ground Covered by Natural Vegetation in a Natural Recovery Area

10% LANDSCAPED AREA

10' FEET

1. PROVIDE LANDSCAPED AREA EQUAL TO OR GREATER THAN 10% OF THE TOTAL PAVED AREA.
2. 10% OR GREATER AREA TO BE LANDSCAPED SHOULD BE LOCATED IN ISLANDS WITHIN THE PAVED AREA AND WITHIN 10' OF THE PERIMETER OF THE PAVED AREA.
3. EXAMPLE: PAVED AREA 15,200 SF
LANDSCAPING (10%) 1,520 SF

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February 2009

10.5.2.6.1 Use shade tree plantings at parking lots to reduce glare and moderate ambient air temperatures on the lot. Optimum spacing of parking lot shade trees is 10 to 12 meters (35 to 40 feet) on center.

10.5.2.6.2 Choose trees and shrubs that require minimum maintenance and will not litter the parking area with leaves, fruit, or nuts.

10.5.2.6.3 Consider sight distances near entrances and exits when selecting and placing plant material.

10.5.2.6.4 Select trees, shrubs, and ground covers that can withstand harsher conditions, such as sun, glare, heat, and reduced water supply.

10.5.5.6.5 Use a mix of evergreen and deciduous plant material to screen parking areas from adjacent uses.

10.5.2.7 Environmental Control Planting. When properly placed, plants can provide environmental benefits, as well as address visual concerns.

10.5.2.7.1 Use deciduous trees and shrubs at courtyards, buildings and along streets to provide shade, moderate temperatures and reduce glare during the summer months while allowing solar exposure in the winter.

10.5.2.7.2 Locate deciduous plantings on the southeast and southwest corner of buildings or courtyards to mitigate solar radiation and glare due to heat build-up and lower sun angles in the mid-morning and late afternoon hours.

10.5.2.7.3 Use mixed massings of deciduous shrubs and evergreen trees and shrubs to provide sound control along primary and secondary roads.

10.5.2.8 Image Planting. The image of the installation is formed by the visual impressions that exist within the installation. The primary locations of highly visible images are the main gate, along primary circulation systems, and at areas of high concentrations of people. Features such as signs, statues, static displays, and other primary visual images can be improved by the use of trees, shrubs, and ground cover.

10.5.2.9 Entrances to the Installation. The entrances and streetscapes into the installation are areas to place landscaping that will develop a strong visual image and provide visual interest during all four seasons. The entrance to the installation creates the first visual impression for the visitor.

10.5.2.9.1 The landscape materials and planting areas should be proportional in scale to the hierarchy of the street on which they are located.

10.5.2.9.2 Landscaping must be integrated with the Force Protection requirements of Section 12. Low shrubs, groundcover, annual/perennial plants and canopy trees provide

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seasonal interest as well as maintain views required to ensure force protection measures. Adequate lines of sight must be maintained for guard personnel to observe vehicular and pedestrian traffic approaching the gate.

10.5.2.10 **Zeroscaping.** Zeroscaping is the use of only inert materials such as rock, gravel, bricks and pavement. When absolutely necessary, zerospacing may be the only option. For a zeroscape installation, landscape rock or gravel will be underlaid with 6-mil plastic. Finished surface is to be 1" below top of curbs and paving. Landscape rock will be 1" – 1.5" and approximately 2" deep. 1" fines will be placed on the plastic to keep the rock from tearing it. Pea gravel is not desirable in areas where pedestrians walk. (Note: Zeroscaping is not the same as "Open Space Planting and Treatment Management" described in 10.5.2.4.)

10.5.2.11 **Xeriscape.** Xeriscape is the use of water-saving landscape designs incorporating desert-adapted plants. It may also include sections of rock landscapes that are typical of zeroscaping (para 10.5.2.10). Instead of 6-mil plastic use woven polypropylene weed barrier. Creative xeriscapes not only look attractive, but also save money, water and maintenance. All tree/plants in a xeriscape installation will be provided with automatic drip irrigation.

10.6 PLANT MATERIAL SELECTION

10.6.1 Trees, shrubs, ground cover and turf are the major elements of a planting composition. Basic plant selection criteria should consider creating a unified composition utilizing native materials for low maintenance and sustainability, avoiding incompatible colors, textures and forms, and matching the appropriate plant to the land use, situation, and environmental condition. Also, plantings in designated historic areas only should follow the Fort Bliss Landscape Handbook for Historic Residences.

10.6.2 The ability of plant material to provide lasting benefit is dependent upon the plant's hardiness and its appropriateness to the site use. Major factors affecting plant hardiness are soil type and organic content, temperature, moisture and light. These climatic conditions can be modified to an extent by specific site conditions, such as wind protection, solar orientation, and planting design, to create microclimates.

10.6.3 Selecting appropriate plants for a given condition is only one aspect of planting design. Compositional arrangement to provide texture variety and to accent site and building features is another. The selection and composition of a planting design requires an understanding of each plant's characteristics, form, and environmental needs as well as how each plant can relate to and complement other plants in the design. Plants are used in four basic design categories (Fig. 10.15):

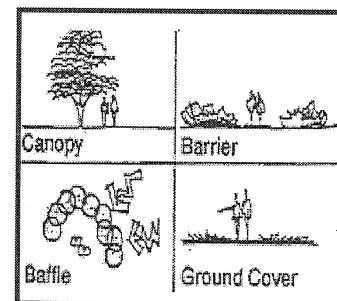


Fig. 10.15 - Four Basic Design Categories

- Canopy
- Barrier
- Screen (or Baffle)

APPENDIX BB

Utility Meter Specifications and Details

Transformer and Electric Meter Specification

Abbreviations:

LDE Land Development Engineer

D/B Design Build Contractor

The following items shall be furnished and installed by the D/B contractor:

1. Structural concrete pad for transformer as detailed on drawing U-837 with the following:

- Extend secondary conduit duct bank to facility service equipment and metering conduit to communications room, furnish and install secondary service conductors and terminate secondary conductors at transformer.
- Add secondary conduits, if required, to match facility service entrance requirements.
- Eight bolts to fasten transformer pad to the vaults

Clarifications—The transformer pad shall be set on concrete vaults furnished and installed by the LDE. The transformer pad is identified as "LID L2" on the attached drawing U-837. The two "LID L1" and the compacted gravel under the transformer pad shall be furnished and installed by the LDE. Secondary and metering conduit ductbank stub-out from vault shall be furnished and installed by the LDE.

2. Outdoor pad-mounted oil-filled transformer with the following ratings and accessories:

- 13.8kV-3Ø-3W Delta primary and 3Ø-4W secondary
- Insulating liquid—Mineral oil: ASTM D 3487, Type II, tested in accordance with ASTM D 117. Provide identification of transformer as "non-PCB" and "Type II mineral oil" on the nameplate.
- High voltage compartment minimum 24" deep from tank to inside of hinged door to accommodate elbow surge arrester connected to 600A dead-break elbow.
- Radial feed with oil immersed primary load-break switch
- Three 600A dead-break bushings with parking stands
- Surge arresters IEEE C62.11, rated 18 kV, 15.3 MCOV, fully shielded, dead-front, metal-oxide-varistor, elbow type with resistance-graded gap, suitable for plugging into inserts. Provide three arresters for radial feed circuits. Surge arresters shall be delivered to Contracting Officer for installation by LDE.
- Ground pads
- Factory installed secondary electronic metering (See item 3 below)
- Tap changer, no-load, externally operable with four 2.5% taps—two above and two below rated primary voltage.

Clarifications—the transformer shall be set on the transformer pad by the D/B contractor. LDE shall furnish and install the 13.8kV conductors, 600A dead-break elbow connectors and connect ground ring ground wires to the ground pads. The LDE shall

install the surge arresters furnished by the D/B contractor. The 13.8kV electrical distribution system is a low-resistance neutral grounded system.

3. Socket mounted electronic programmable outdoor watt-hour meter, surface mounted flush against the side of the low voltage compartment with the following ratings and accessories:
 - Meter shall be designed for use on a 3Ø-4W system with current transformers. Current transformer shorting terminal strips shall be furnished.
 - Include necessary KYZ pulse initiation hardware for Energy Monitoring and Control System (EMCS).
 - The meter shall be Class 20, Form 9S with an accuracy of +/- 1.0 percent
 - Meter fusing—provide a fuse block mounted in the secondary compartment containing one fuse per phase to protect the voltage input to the watt-hour meter. Size fuses as recommended by the meter manufacturer.
 - The meter cover shall be polycarbonate and lockable.
 - The kilowatt-hour register shall be 5 digit electronic type with a solid state demand register and meter reading multiplier. Demand intervals shall be 15 minutes with rolling demand up to 6 subintervals per interval.
 - The meter socket shall be NEMA 3R, box mounted and have automatic circuit closing bypass and having jaws compatible with requirements of the meter. Paint to match transformer.

WATER METER SPECIFICATIONS

1.1. Displacement Type Meters

Meters 2" in size and smaller shall be displacement type meters. Displacement type meters shall conform to AWWA C700. Registers shall be straight-reading and shall read in U.S. gallons. Meters in sizes 1/2 through 1 shall be frost-protection design. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be an encoder type remote register designed in accordance with AWWA C707. Meters shall comply with the accuracy and capacity requirements of AWWA C700.

1.2. Turbine Type Meters

All meters 2.5" and larger shall be turbine type meters. Turbine type meters shall conform to AWWA C701 Class I. The main casing shall be bronze with stainless steel external fasteners. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be an encoder type remote register designed in accordance with AWWA C707. Meters shall comply with the accuracy and capacity requirements of AWWA C701.

1.3. Compound Type Meters

Compound type meters shall conform to AWWA C702 and shall be furnished with strainers. The main casing shall be bronze with stainless steel external fasteners. The main casing shall be tapped for field testing purposes. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. The meter shall be equipped with a coordinating register. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be an encoder type remote register designed in accordance with AWWA C707. Meters shall comply with the accuracy and capacity requirements of AWWA C702.

1.4. Meter Vaults

Meters 2.5" and larger in size shall be installed in reinforced concrete vaults in accordance with the El Paso Water Utilities Public Service Board Detail No. 290-3 and Detail No. 294. Meter vaults and covers within roadways and POV paved areas shall be rated for H-20 loading. Meter vaults and covers within GOV areas and access drives shall be rated for the heaviest proposed loading in the parking area.

1.5. Meter Boxes

Meters 2" in size and smaller shall be set in reinforced concrete meter boxes in accordance with the El Paso Water Utilities Public Service Board Detail No. 290-2 and Detail No. 293. The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes set in paved areas subject to vehicular traffic shall be concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall use concrete covers with cast iron meter reader lids. Plastic boxes and lids shall not be used in any area. Box height shall

extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.

1.6 Accessories

Provide a 1" conduit from each meter vault or meter box to the building mechanical room. Provide an accumulator and data pulse logger for each building complying with the following:

The Pulse Logger must be web-enabled and be capable of recording pulses from gas or water meters. It must be able to accept at least 4 pulse inputs. The logger must have Ethernet communication capabilities. Consumption data must be transmitted either via email and/or ftp in XML formats. The Pulse Logger's features and capabilities must include:

- ⇒ View Load Profile data using the built in Web Server.
- ⇒ Transmits reports via email or ftp or both.
- ⇒ CC a secondary email recipient.
- ⇒ Open Protocols XML, HTTP, SMTP, SNTP, FTP, DHCP, DNS.
- ⇒ Compact size 3.0" X 3.25" X 1.25".
- ⇒ Comes with a 110~220 VAC to 12VDC power supply.
- ⇒ RJ45 Ethernet Network jack.
- ⇒ ROHS Compliant for Europe.
- ⇒ Safe log-in to the Web Server via password authentication.
- ⇒ Secure data storage in non volatile memory with Lithium Ion Battery backup.
- ⇒ Lithium Ion Battery backup for storing data during power outages.
- ⇒ Recharging of Lithium Ion battery occurs automatically.
- ⇒ High measurement rate of up to 100 pulses per second.
- ⇒ Compatible with any network using DHCP or static IP Addressing.
- ⇒ Uses SNTP for highly accurate time stamping.
- ⇒ Day Time client integrated if SNTP server is not accessible.
- ⇒ International Time Zone support.
- ⇒ User Configurable
 - Logging interval from 5 minutes to 60 minutes.
 - Reporting interval from 5 minutes to hourly, daily, or weekly.
 - 16 character alpha numeric ID.
 - 20 character alpha numeric Serial Number.
 - 80 character Location / Address.
 - User configurable SNTP server.
 - Time Stamps can be in USA or European format.

Connection to the base wide EMCS system will be by others and is not included in this scope of work.



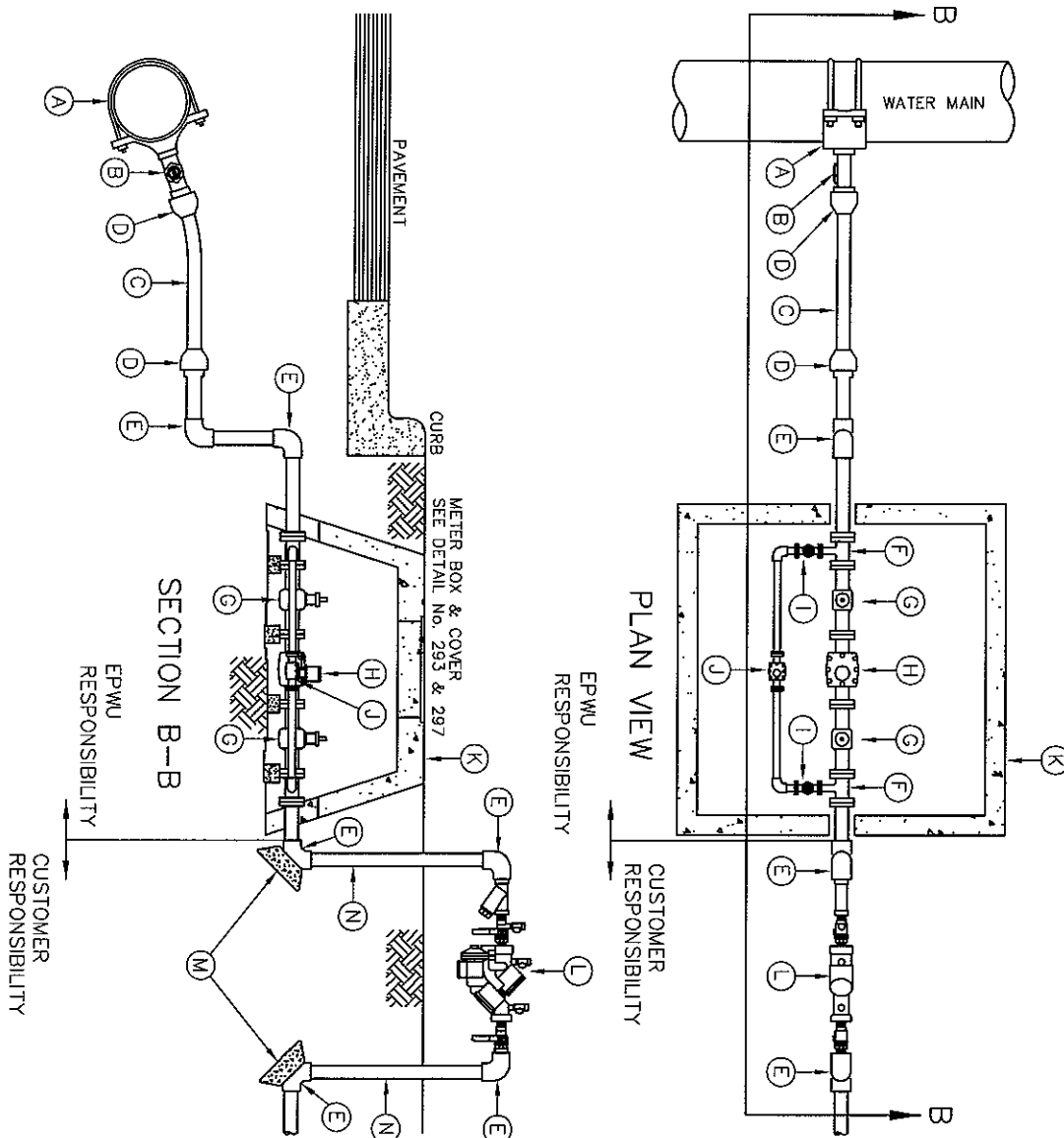
STANDARD
DETAIL

DATE: 12/12/1996
REV: 7/24/2001

TYPICAL 1½" SERVICE LINE
INSTALLATION BY PSB
N.T.S.

EL PASO WATER UTILITIES
BOARD
PUBLIC SERVICES

DETAIL NO.
290-2



GENERAL NOTES:

1. DETAIL SHOWN FOR 1 1/2" SERVICE. INSTALLATION SIMILAR FOR 2" SERVICE EXCEPT FOR SIZES OF PIPE, FITTINGS AND METER. WHEN SPECIFIED A 1" BY-PASS METER SHALL BE INSTALLED WITH A 1 1/2" SERVICE, A 2" SERVICE SHALL INCLUDE A 1" BY-PASS METER
2. WHERE NO CURB EXISTS, METER IS TO BE SET NEAR PROPERTY LINE OR AT DESIGNATED LOCATION.
3. THE EPWU WILL FURNISH AND INSTALL ALL NECESSARY PIPE, FITTINGS, METER BOXES, AND METERS REQUIRED. IT SHALL BE THE RESPONSIBILITY OF THE PRIVATE OWNER TO HAVE A CERTIFIED PLUMBER INSTALL A BACKFLOW PREVENTER AND EXTEND SERVICE LINE ON DISCHARGE SIDE OF METER.

CONSTRUCTION KEY NOTES:

- A. SERVICE SADDLE
- B. 1 1/2" TAP WITH CORPORATION STOP
- C. 1 1/2" COPPER PIPE. FOR 1 1/2" & 2" SERVICE INSTALLATIONS, ALL PIPING SHALL BE COPPER AND ALL FITTINGS SHALL BE BRONZE UNLESS OTHERWISE SPECIFIED.
- D. UNION
- E. BEND 90°
- F. TEE
- G. 1 1/2" GATE VALVE
- H. 1 1/2" TURBINE METER
- I. CURB VALVE
- J. 1" BY-PASS METER
- K. STANDARD METER BOX TYPE "C"
- L. BACKFLOW PREVENTER WHEN REQUIRED BY EPWU
- M. THRUST BLOCKING AS REQUIRED
- N. 1 1/2" BRASS PIPE-LENGTH AS REQUIRED



STANDARD
DETAIL

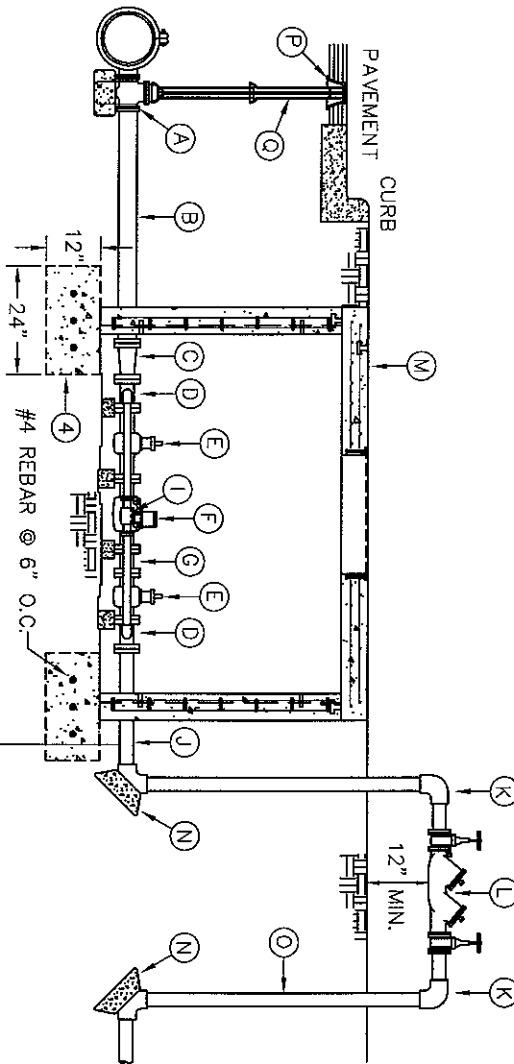
DATE: 1/29/1997
REV: 7/25/2001

TYPICAL 3" AND LARGER
SERVICE LINE INSTALLATION BY PSB
N.T.S.



DETAIL No.
290-3

SECTION A-A



PLAN VIEW

CUSTOMER
RESPONSIBILITY

1. DETAIL SHOWN FOR 3" SERVICE: INSTALLATION SIMILAR FOR LARGER SERVICES EXCEPT FOR SIZE OF PIPE, FITTINGS AND METER.
2. WHERE NO CURB EXISTS, METER IS TO BE SET NEAR PROPERTY LINE OR AT DESIGNATED LOCATION.
3. THE EPWU WILL FURNISH AND INSTALL ALL NECESSARY PIPE, FITTINGS, METER BOXES, AND METERS REQUIRED. IT SHALL BE THE RESPONSIBILITY OF THE PRIVATE OWNER TO HAVE A CERTIFIED PLUMBER INSTALL A BACKFLOW PREVENTER AND EXTEND SERVICE LINE ON DISCHARGE SIDE OF METER.
4. FOOTING REQUIRED WHEN PLACED UNDER EXISTING OR PROPOSED STREET PAVING.

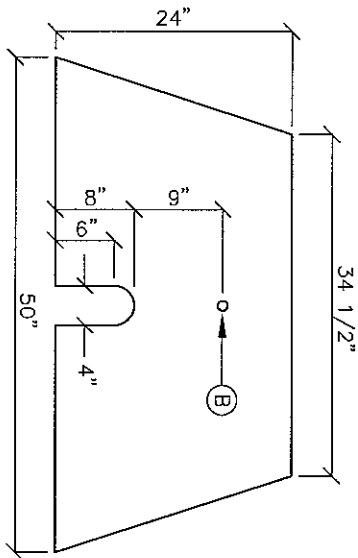
CONSTRUCTION KEY NOTES:

- A. 4" TAPPING SLEEVE AND VALVE
- B. 4" P.V.C.
- C. 4"x3" REDUCER
- D. 3"x2" TEE
- E. 3" GATE VALVE
- F. 3" METER
- G. 3" TEST PLUG D.I.P.
- H. 2" GATE VALVE
- I. 2" BY-PASS METER
- J. 3" SPOOL D.I.P.
- K. 3" BEND 90°
- L. 3" BACKFLOW PREVENTER
- M. STANDARD METER BOX TYPE "D"
- N. THRUST BLOCKING AS REQUIRED
- O. 3" FLANGED D.I.P. - LENGTH AS REQUIRED
- P. BONNET BOX AND COVER IN ACCORDANCE WITH DET 269.
- Q. PIPE AS PER EPWU STANDARD DET 260.

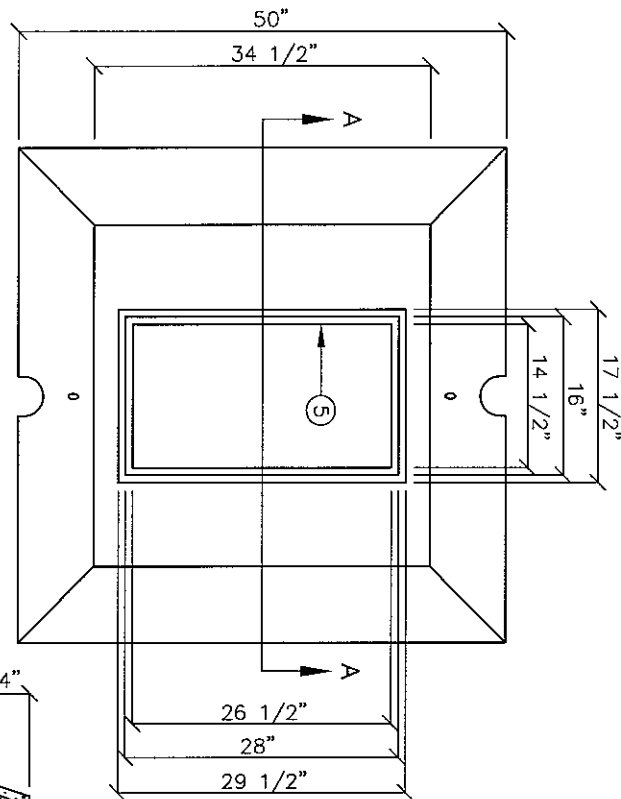
GENERAL NOTES:

STANDARD
DETAILAPR. 1994
REV. OCT. 1994METER BOX TYPE "C"
1 1/2" TO 2" SERVICE INSTALLATION
N.T.S.EL PASO WATER UTILITIES
PUBLIC SERVICES BOARDDETAIL No.
293

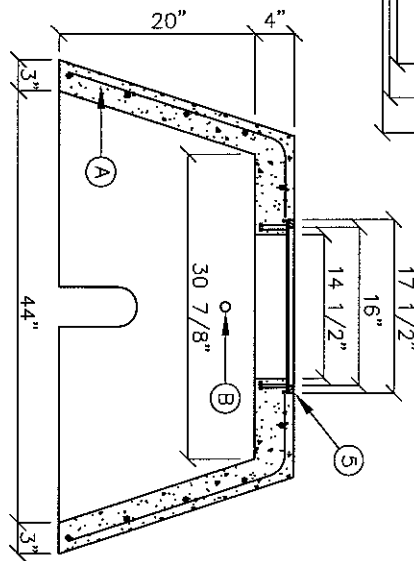
FRONT VIEW



TOP VIEW

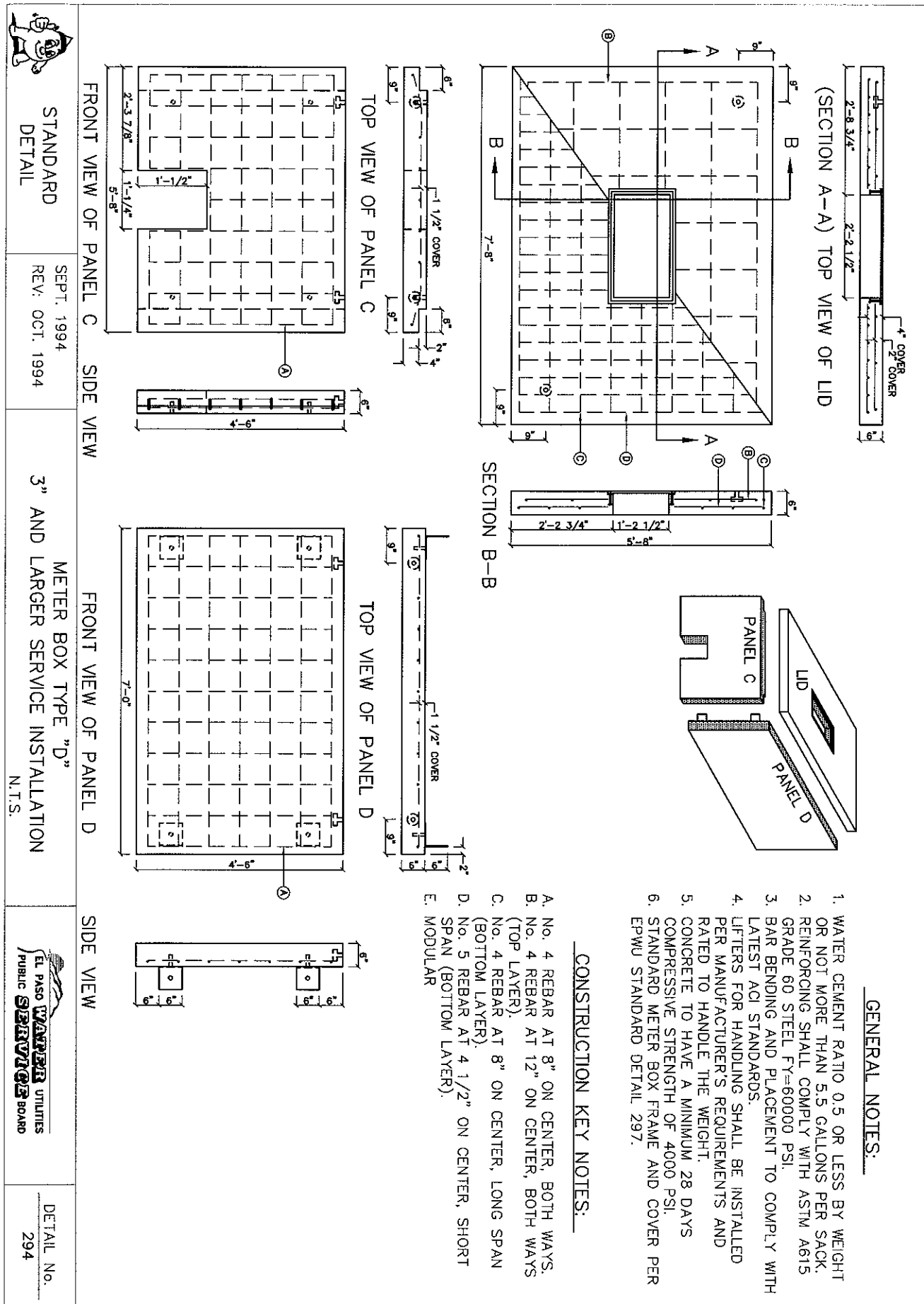


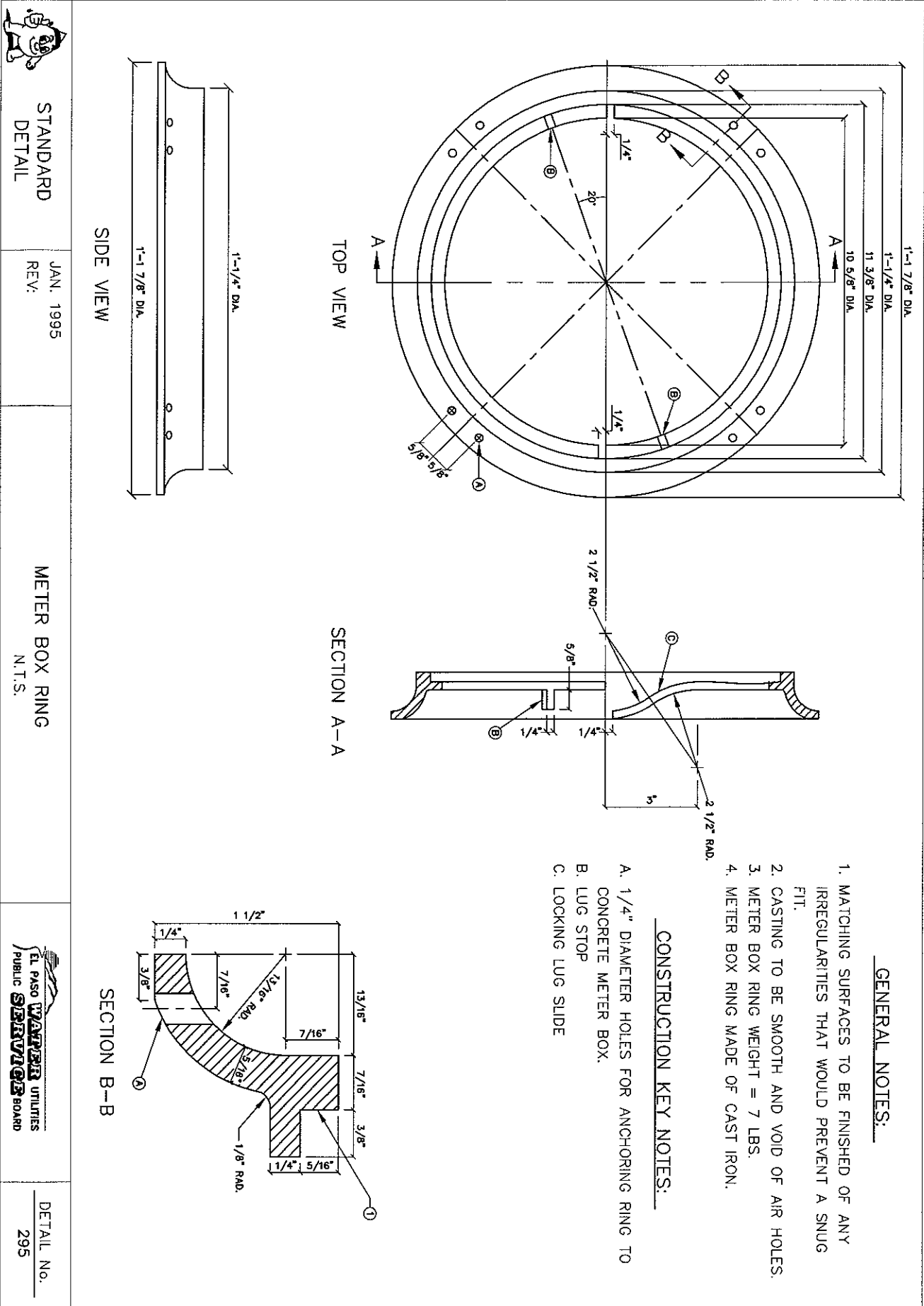
SECTION A-A

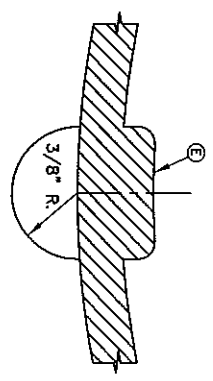
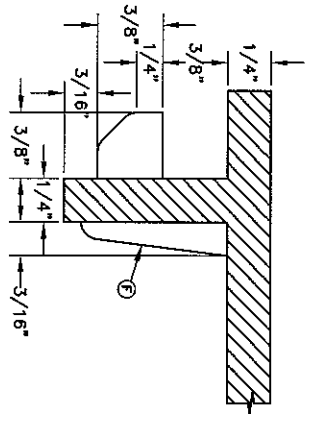
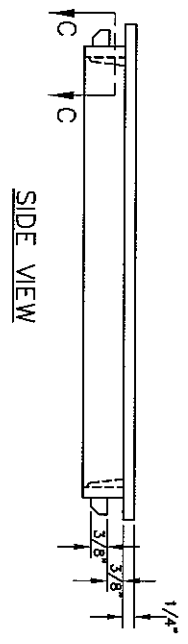
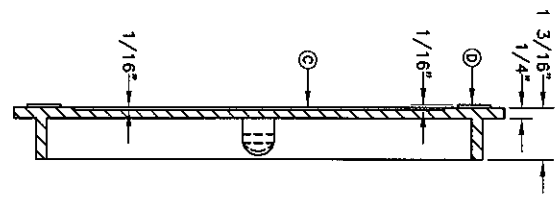
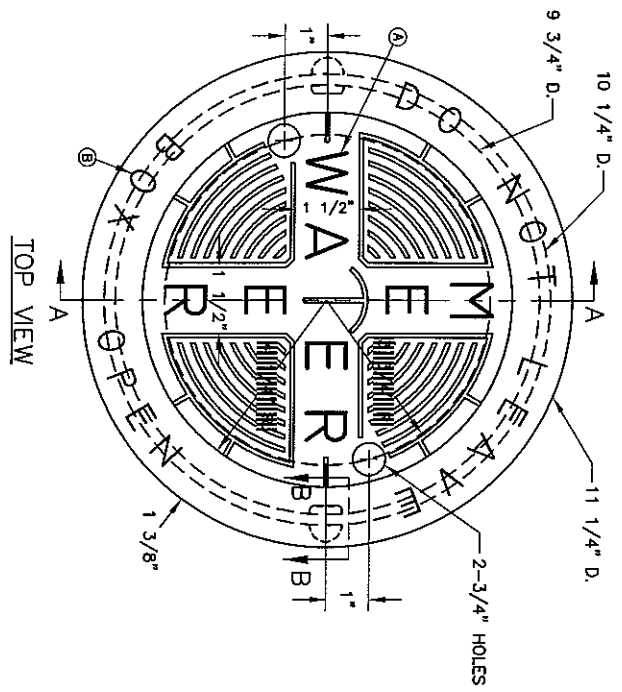
CONSTRUCTION KEY NOTES:

1. INSTALL TO GRADE MATCHING TOP OF CURB.
2. ANGLE VALVE SHALL BE IN LINE WITH THE INLET/OUTLET PORTS OF THE METER BOX.
3. METER BOXES SHALL NOT BE INSTALLED UNDER SIDEWALKS, DRIVEWAYS, OR PROPOSED ABOVE GROUND STRUCTURES.
4. WHERE NO CURBING EXIST, INSTALL BOXES IN ACCESSIBLE LOCATIONS BEYOND LIMITS OF STREET SURFACING, WALKS AND DRIVEWAYS.
5. STANDARD METER BOX FRAME AND COVER PER EPWU STANDARD DETAIL 297.

GENERAL NOTES:







GENERAL NOTES:

1. MATCHING SURFACES TO BE ROUGH GROUND OF ANY IRREGULARITIES THAT WOULD PREVENT A SNUG FIT.
2. CASTING TO BE SMOOTH AND VOID OF AIR
3. METER BOX COVER WEIGHT= 1 1/4 lbs.

CONSTRUCTION KEY NOTES

- A. LETTERS TO BE 1" HIGH, 3/4" WIDE, 1/8" THICK
- B. LETTERS TO BE 3/4" HIGH, 5/8" WIDE, 1/8" THICK
- C. INSIDE LETTERS & RIBS 1/16" TALL
- D. OUTSIDE LETTERS 1/16" TALL
- E. REINFORCE BACK OF LUG
- F. REINFORCEMENT



STANDARD
DETAIL

APR. 1994
REV. 08-06-97

METER BOX COVER
N.T.S.



DETAIL No.
296

APPENDIX CC

Waste Management Documents

El Paso and Regional Recyclers

<http://www.yellow.com/>

http://www.cleantexas.org/index.cfm?fuseaction=public.memberprofiles_bymembername_rtolquery1

<http://www.tceq.state.tx.us/assistance/P2Recycle/renew/renew.html>

Company	Address	Phone	Notes
Acoustic Tile			
WeRecycle, Inc.	500 South Broad St., Meriden, CT 06450	203-630-0344	carpet, ceiling tiles, pallets
Cardboard/Paper/Fiber			
Durango McKinley Paper Co	1520 Myrtle Ave., El Paso	915-351-7970	drop off services available
Master Fibers Inc.	1710 East Paisano Dr., El Paso	915-544-2299	drop off services available, top prices paid for cardboard, customized recycling program
Twin Cities Recyclers Co., Inc.	3230 Durazno Ave., El Paso	915-543-3000	top prices paid for paper, industrial plastics, metal, wood pallets, Customized recycling programs available
The UPS Stores	955 North Resler Dr., El Paso	915-842-8075	packing peanuts, cardboard, other packing material
Bryan Drive-In Recycling Center	2202 Briarcrest Dr., Bryan, TX 77802	979-209-5675	
Carpet/Carpet Tile			
Sunshine Padding and Foam	8172 Elder Creek Rd, Sacramento, CA 95824	916-383-5213	accepts carpet, padding, foam, mail in program
WeRecycle, Inc.	500 South Broad St., Meriden, CT 06450	203-630-0344	carpet, ceiling tiles, pallets
Landfill/Hauling/Collection			
Duncan Disposal/Alpine	3001 Old Marathon Hwy., Alpine, TX 79830	432-837-1244	Hauling, Collection, Landfill (approx 200 miles from El Paso)
Charter Landfill	12035 West Murphy St., Odessa, TX 79763	432-381-4722	landfill (approx 240 miles from El Paso)
Duncan Disposal/Midland	8220 West Hwy. 80, Midland, TX 79706	432-563-5060	Hauling, Collection (approx 260 miles from El Paso)
Saguaro Environmental Svcs	5055 South Swan Rd, Tucson, AZ 85706	520-745-8820	Hauling/Collection (approx 260 miles from El Paso)
Duncan Disposal/Lubbock	1408 N. Martin Luther King Blvd., Lubbock, TX 79403	806-762-6464	Hauling, Collection (approx 300 miles from El Paso)

Company	Address	Phone	Notes
San Angelo Landfill	1422 Hughes Ave., San Angelo, TX 76903	325-655-6869	landfill (approx 360 miles from El Paso)
TrashAway Svcs Duncan San Angelo	1422 Hughes Ave., San Angelo, TX 76903	325-653-6957	Hauling, Collection (approx 36 miles from El Paso)
Metal			
American Metal Recycling	11201 Alameda Ave., Socorro, TX	915-859-4916	
Asa Recycling	1042 Eastside Road, El Paso	915-779-3326	drop off services available
Discover Recycling	3845 Durazno Ave., El Paso	915-544-8414	drop off services available
El Paso Iron and Metal	1535 East San Antonio Ave., El Paso	915-532-6981	
Lopez Scap Metal, Inc.	351 North Nevarez Rd., El Paso	915-859-0770	drop off services available
Lucero Scrap	10717 Alameda Ave., Socorro, TX	915-872-9880	pick-up services available, provide containers
M&M Metal Inc.	12751 Pellicano Dr., El Paso	915-852-2080	
Shapiro Sales Co	206 Dodge Rd., El Paso	915-881-1991	drop off services available
Twin Cities Recyclers Co., Inc.	3230 Durazno Ave., El Paso	915-543-3000	top prices paid for paper, industrial plastics, metal, wood pallets, Customized recycling programs available
W Silver Recycling, Inc.	1720 Magoffin Ave., El Paso	915-532-5643	Container and trailer service available
Environmental Center	800 South Piedras, El Paso	915-593-2784	
Bryan Drive-In Recycling Center	2202 Briarcrest Dr., Bryan, TX 77802	979-209-5675	
Plastics			
Discover Recycling	3845 Durazno Ave., El Paso	915-544-8414	drop off services available
National Recycling, Inc.	10400 Griffin Rd., Suite 101, Cooper City, FL, 33328	954-680-8802	buy, sell, offers waste stream solutions,
Twin Cities Recyclers Co., Inc.	3230 Durazno Ave., El Paso	915-543-3000	top prices paid for paper, industrial plastics, metal, wood pallets, Customized recycling programs available
United Plastics Services	12572 Darrington Rd., Suite 10, Horizon City, TX	915-851-9460	
Environmental Center	800 South Piedras, El Paso	915-593-2784	#1, #2
FDA Packaging	2355 Nevada St., Las Cruces, NM 88001	505-524-1997	#6
The UPS Stores	955 North Resler Dr., El Paso	915-842-8075	packing peanuts, cardboard, other packing material
The Alliance of Foam Packaging Recyclers	2128 Esprey Court, Crofton, MD 21114	800-944-8448	packing peanuts, other forms of packing material, foam
Bryan Drive-In Recycling Center	2202 Briarcrest Dr., Bryan, TX 77802	979-209-5675	#1, #2
Diversified Plastics Recycling	7340 State Road 245 East, North Lewisburg, OH 43060	937-747-3040	#1, #2, #4, #5, #6, #7

Company	Address	Phone	Notes
Propoly	Marlboro, NJ 07746	732-431-2200	#1, #2, #3, #4, #5, #6, #7
Wood			
Custom Crates and Pallets	1501 Westway Blvd., Canutillo, TX	915-892-2660	
Forproducts Corp	3624 East Gateway, El Paso	915-532-6710	pulpwood
Kastro's Wood Pallets, Inc.	13781 Davidson Blvd., El Paso	915-855-8011	
Twin Cities Recyclers Co., Inc.	3230 Durazno Ave., El Paso	915-543-3000	top prices paid for paper, industrial plastics, metal, wood pallets, Customized recycling programs available
WeRecycle, Inc.	500 South Broad St., Meriden, CT 06450	203-630-0344	carpet, ceiling tiles, pallets
Unknown Material			
Alpha Recycling	1820 East Mills Ave., El Paso	915-313-0333	drop off services available
Border Trading, Inc.	6940 Commerce Ave., El Paso	915-775-2546	drop off services available
Gandara's Recycling	10721 North Loop Dr., Socorro, TX	915-860-9596	drop off services available
Haro's Company, Inc.	11369 Alameda Ave., Socorro, TX	915-851-2028	drop off services available
Newell Recycling of El Paso	6800 Market Ave., El Paso	915-772-2728	
RG&M	11309 Alameda Ave., Socorro, TX	915-851-0995	drop off services available



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New Construction Waste Management

Plans and Methods



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Army Policy on Waste Management

- 50% diversion (by weight) from landfill of construction and demolition waste for all Army projects.
- Waste type and quantities must be tracked, documented, and upward reported (SWAR)



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Contract Requirements for Waste Management

- 50% diversion (by weight) from landfill of construction and demolition waste
(01010, Section 6)
- A Waste Management Plan is required
(01355 Environmental Protection Plan)



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Added Bonus

- The two easiest LEED credit points:
 - Automatically pick up LEED Credit MR 2.1
(Achieve 50% diversion of C&D waste from landfill)
 - With little effort, pick up LEED Credit MR 2.2
(Achieve 75% diversion of C&D waste from landfill)



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Management Plan

- Section 1 – Company Philosophy
- Section 2 – Project Waste Management Goals
- Section 3 – Communication Plan
- Section 4 – Expected Waste Streams, Disposal, and Handling



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How to Meet Army and USACE Waste Management Goals (WMP Section 2)

- Prevent – don't create/promote the waste in the first place
- Reduce – reduce the amount of waste generated for a given material/element
- Reuse – reuse scrap
- Recycle – send back to the company for remanufacturing or to a recycling facility



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Prevention

- Pre-fabrication/Pre-cut – manufacture to exact dimensions
- Accurately order the amount of material needed
- Measure carefully to avoid end cuts
- Store materials so they are not damaged



Reduce

- Order and ship in bulk where possible, avoiding excess packaging
- To encourage efficient use of materials, avoid paying installers on the basis of smaller units of measure (i.e. sq. ft. instead of sheet)
- GCs include similar recycling/diversion requirements in subcontracts (incl. Mgmt Plans, monitoring, and documentation).



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Reuse

- Save sizeable pieces for use elsewhere
 - carpet tiles piece from one edge may fit at the edge of another location
 - wallboard pieces can be used around doors and windows
 - lumber pieces can be used as spacers or blocking
 - Reuse PVC cut-offs for use as stubs for wall drains
- Optimum Value Engineering for wood construction



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Recycle

- Concrete/Asphalt/Masonry
- Drywall/Gypsum
- Metal
- Plastics
- Cardboard/paper/fibers
- Site/Landclearing Debris
(vegetation, soils)
- Wood
- Glass
- Carpet/Carpet
Tile
- Paints
- Floor Tile
- Acoustical Tile



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Ft. Bliss Resources

- Now
 - Cardboard/paper – Ft. Bliss can accept small quantities of paper and cardboard for recycling
- Future
 - Clean wood – Ft. Bliss owns a shredder, but no end use of shredded material is currently identified.
 - Soil –provide native fill material, accept native soil
 - Concrete/Aggregate/Asphalt/Masonry



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Site Handling

- Interior collection containers in centralized convenient locations for the trades.
- Exterior recycling containers clearly labeled and located in convenient locations for the trades.
- For pieces of materials to be reused – make sure the trades know where they can find these materials.



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Site Handling

- Keep garbage out of interior and recycling containers.
- Provide frequent and well labeled garbage containers, both interior and exterior.
- Training and Communication
- Whole Building Design Guide Construction Waste Management Resource Page (www.wbdg.org/design/cwm.php)



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Keeping Track

- Collect and organize documentation from receiving facilities (weight tickets, reports)
- Obtain/Estimate weights for those items not taken to a facility (elements returned to manufacture, wood taken to Ft. Bliss for mulching, etc.)
- Organize incoming information daily (DCQCRs, Excel spreadsheet)
- Keep quarterly (Dec, March, June, and Oct) and final (end of project) reports in mind
 - keeping track daily/regularly will make the final report easy.



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Government Oversight

- Plan-Do-Check-Act
- Review and approval of Waste Mgmt Plan prior to start of construction.
- QAR will check regularly interior and exterior collection bins to confirm appropriate use.
- QAR will ask regularly to see your tracking document/notebook/file.
- QAR will conduct periodic quick calculations to confirm that waste diversion is on track.
- Final waste report – diversion calculation must be verifiable (values easily matched to waste documentation)



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Questions?



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Need Help?

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Thomas.R.Napier@usace.army.mil

Tips to improve Reduce, Reuse, and Recycle

Material	Planning	On-Site
General	<ul style="list-style-type: none"> > Order products with recycled content. > To reduce waste and cost, accurately order in the amount of material needed. > Request suppliers to limit packaging. > Ask your vendors to take non-recyclable packaging back for reuse. > Use larger pieces elsewhere on the project (fillers and shorter pieces can be used to fill in). 	<ul style="list-style-type: none"> > Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled. > Store materials so they are not damaged. > Measure carefully to avoid end cuts.
Concrete	<ul style="list-style-type: none"> > Use concrete mix containing fly ash as part of the cementitious content of the concrete. > Request CMUs that contain recycled content from your supplier. 	<ul style="list-style-type: none"> > Separate and recycle asphalt and concrete. > Use reusable forms and supports to the maximum extent possible. > Reuse removed crushed concrete and asphalt as aggregate, sub-base material or fill. > Designate a location for excess concrete for use in paving, post footing anchorage, reinforcement, etc. > Store materials so that they are not damaged or discolored.
Drywall	<ul style="list-style-type: none"> > Order drywall with recycled content gypsum. > To reduce waste and cost, accurately order in the amount of material needed. > To encourage efficient use of materials, avoid paying installers on the basis of sheets of material installed (try using sq. ft. installed instead). 	<ul style="list-style-type: none"> > Store materials so they are not damaged. > Measure carefully to avoid end cuts. > Separate and recycle waste drywall. > Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled. > Save sizeable pieces of drywall for use around doors, windows, or built-ins, or for reuse on another job.
Electrical	<ul style="list-style-type: none"> > Order plumbing and other mechanical supplies with recycled content. > To reduce waste and cost, accurately order the amount of material needed. > Ask your vendors to reduce the amount of packaging (pallets, cardboard, plastic shrink wrap, metal bands) that is delivered to the job-site. > Ask your vendors to take non-recyclable packaging back for reuse. 	<ul style="list-style-type: none"> > Separate and recycle cardboard. > Separate and recycle metals and wire. > Separate and recycle plastics, such as PVC pipe. > Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled. > Store materials so they are not damaged. > Measure carefully to avoid end cuts.

Material	Planning	On-Site
Mechanical	<ul style="list-style-type: none"> > Order electrical, plumbing, and other mechanical supplies with recycled content. > To reduce waste and cost, accurately order the amount of material needed. > Ask your vendors to reduce the amount of packaging (pallets, cardboard, plastic shrink wrap, metal bands) that is delivered to the job-site. > Try precut and prefabricated components such as commercial heating and cooling ductwork or commercial sprinkler systems. > Ask your vendors to take non-recyclable packaging back for reuse. 	<ul style="list-style-type: none"> > Separate and recycle cardboard. > Separate and recycle plastics, such as PVC pipe. > Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled. > Store materials so they are not damaged. > Measure carefully to avoid end cuts.
Plumbing	<ul style="list-style-type: none"> > Order plumbing and other mechanical supplies with recycled content. > To reduce waste and cost, accurately order the amount of material needed. > Ask your vendors to reduce the amount of packaging (pallets, cardboard, plastic shrink wrap, metal bands) that is delivered to the job-site. > Ask your vendors to take non-recyclable packaging back for reuse. 	<ul style="list-style-type: none"> > Retain PVC cut-offs for use as stubs for wall drains. > Properly clean joints to prevent leaking. > Separate and recycle plastic, including PVC, if possible. > Separate and recycle cardboard. > Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled. > Store materials so they are not damaged. > Measure carefully to avoid end cuts.
Site/Landclearing	<ul style="list-style-type: none"> > shred vegetation for reuse in project landscaping. > design landscaping that reuses stone. 	<ul style="list-style-type: none"> > Separate and recycle asphalt and concrete/masonry. > Sell all marketable trees designated for removal. > Grind, chip, or shred other vegetation for mulching and composting. > Separate stumps, brush, and other wood waste for recycling. > Separate and recycle rebar and other metals. > Reuse removed crushed concrete and asphalt as aggregate, sub-base material or fill. > Provide on-site locations for as much excavated rock, soil, and vegetation as possible.

Material	Planning	On-Site
Wood	<ul style="list-style-type: none">> To reduce waste and cost, accurately order the amount of material needed.> Use larger pieces elsewhere on the project (fillers and shorter pieces can be used to fill in).> Use building systems such as modular systems or foam-core panels that minimize the use of wood (systems that contain recycled wood chips or wood from small diameter secondary trees).	<ul style="list-style-type: none">> Segregate bits and ends for recycling from useable pieces to be used elsewhere.> Make sure both interior collection containers and exterior recycling dumpsters are convenient and clearly labeled.> Store materials so they are not damaged.> Measure carefully to avoid end cuts.> Save sizeable pieces of wood in a central area for use as spacers, blocking, kindling, or for use on another job.> Designate a central area for end-cuts and damaged wood, making it convenient for carpenters to find and use scrap wood.

CONSTRUCTION / DEMOLITION SWARWeb PICKLIST		
MAJOR CATEGORY	SUB-CATEGORY	DEFINITION
Wood		
	Structural	TBD
	Finished	TBD
	Treated	TBD
	Other (C/D Wood)	TBD
Metal		
	Steel	TBD
	Copper	TBD
	Aluminum	TBD
	Mixed Metal	TBD
	Other (C/D Metal)	TBD
Masonry/Asphalt/Concrete/ Stone		
	Asphalt	TBD
	Brick	TBD
	Concrete	TBD
	Concrete Block Unit	TBD
	Stone	TBD
	Other (C/D Masonry/Asphalt)	TBD
Land Clearing Debris		
	Top Soil	TBD
	Sub Soil	TBD
	Petroleum-Contaminated Soil	TBD
	Non-Hazardous Lead-Contaminated Soil	TBD
	Vegetation/Timber (tree trunks & limbs)	TBD
	Crushed Stone/Base	TBD
	Other (C/D Land Clearing)	TBD
Other		
	Siding	TBD
	Composition Roof	TBD
	Insulation	TBD
	Doors/Windows/Stairs/Cabinets	TBD
	Ceiling Tile	TBD
	Gypsum/Plaster	TBD
	Plastic	TBD
	Glass	TBD
	Paper	TBD
	Other (C/D Other)	TBD
Additional Information		
Project Number		
Building Number(s)		
Reuse (Installation)		
Reuse (Off-Site)		
Recycle (Installation)		
Recycle (Off-Site)		
Bury (Installation)		
Bury (Off-Site)		
Dispose (Installation)		
Dispose (Off-Site)		
Other		
Source: Army Environmental Center, Charles Harris, (410) 436-1224, charles.harris2@us.army.mil		

Non- Hazardous Waste Management Plan

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Specific actions that will be taken to reduce solid waste generation.
- c. Description of the specific approaches to be used in salvage/reuse/recycling/other diversion of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Identification of waste streams, including estimated types and quantities, of the waste to be generated.
- e. Identification of local and regional salvage/reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.
- f. List of specific waste materials that will be salvaged for resale, salvaged for reuse, or recycled. Recycling facilities that will be used shall be identified. If a recycling facility (public or private) exists within a 50 mile radius of the project site, its use is required for all materials that facility accepts and that cannot be otherwise reused.
- g. Identification of materials that cannot be recycled/reused with an explanation or justification.
- h. Name of landfill and/or incinerator to be used for waste that are not diverted and the estimated costs for disposal.
- i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Hazardous Waste Management Plan (in addition to the requirements above)

- a. Types of wastes anticipated to be managed. This should include a discussion of processes which are generating the waste, the volumes anticipated, and the EPA/state waste codes associated with the waste (40 CFR 261, Subpart C and D).
- b. The regulatory status of the waste. In other words, whether the waste is subject to large quantity generator, small quantity generator, or conditionally exempt small quantity generator standards (40 CFR 262.34).
- c. The locations in which wastes will be accumulated will be discussed. This should discuss whether these are 90/180 day accumulation areas, satellite accumulation points,

or permitted storage areas. Preferably a map indicating the precise location should be included (40 CFR 262.34).

d. Inspection requirements. This should discuss what will be inspected, how often it will be inspected, who will conduct the inspection, what the inspection log will contain, and where the inspection records will be retained (40 CFR 262.34, 40 CFR 265.174, and 40 CFR 265.195).

e. Contingency Planning. Large quantity generators are required to have a contingency plan. Small quantity generators are required to post certain information (40 CFR 262.34 and 40 CFR 265 Subparts C and D).

f. Marking requirements. This should discuss what type of hazardous waste markings are to be utilized during accumulation (40 CFR 262.32).

g. Container types. Types of containers used to accumulate hazardous wastes should be identified. Compatibility with the waste being stored should be considered as well as whether the containers will meet packaging requirements for off-site transport (49 CFR 171.178).

h. Treatment requirements. How will wastes be treated to meet land disposal restrictions (40 CFR 268.40). If elementary neutralization is being performed to render waste non-hazardous, a statement should be included which indicates the activity is being performed under a permit exclusion (40 CFR 270.1(c)(2)(v)).

i. Disposal requirements. This should discuss whether wastes and/or treatment residues will be disposed in a Subtitle C, hazardous waste disposal facility or in a Subtitle D, nonhazardous waste facility.

j. Proposed treatment, storage, or disposal facilities (TSDFs). This should provide the name, address, telephone number, and EPA ID number of the TSDFs proposed to be utilized for the waste.

k. LDR forms. This should provide copies of the LDR forms from the proposed receiving facilities.

l. Recycling Facilities. This should discuss how the waste is to be salvaged, reused, and/or recycled. The name, address, and phone number of the facilities proposed for waste diversion should be provided.

Waste Management Plan Template

Section 1. Company Mission Statement/Company Philosophy and Organization

- a. Philosophy – basic company approach to waste management (i.e.: prevent, reduce, reuse, recycle, dispose)

Section 2. Project Waste Management Goal

- a. Contract required goal.
- b. Specific actions that will be taken to prevent or reduce solid waste generation. This includes identifying those companies providing material and equipment that are willing to accept the return of the resulting waste product after installation (floor tiles, ceiling/acoustical tiles, carpet tiles, etc.). Also identify material/companies willing to send large quantities of items in bulk, rather than individually wrapped (box of 200 door knobs instead of individually wrapped door knobs, pallets of stacked floor tiles instead of box of 12 floor tiles).
- c. Description of the specific approaches to be used in salvage/reuse/recycling/other diversion of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. List of specific waste materials that will be salvaged for resale, salvaged for reuse, or recycled.
- e. Identification of materials that cannot be recycled/reused with an explanation or justification.

Generally, its better (more resourceful) to reduce, than to reuse, and better to reuse than to recycle. However, it's not realistic to eliminate all waste, or salvage all materials not used on a particular job. Following is our Waste Management Plan.

Reduce means to prevent waste before it happens. You can reduce waste significantly on a construction project by “tweaking” your practices a bit; this means designing in less waste to begin with and minimizing damage and inefficient material use.

Reuse means to reuse materials as much as possible in your construction project. This includes:

- Materials removed during demolition
- Scrap generated on site
- Used materials or scraps from other jobs

Recycle means to separate recyclable materials from non-recyclable materials and supply them to a hauler or business so they can be processed and used to make new products. Another aspect of recycling is to Buy Recycled. Buying building materials with recycled content helps develop a market for the waste materials you recycle from your job site and “closes the loop.”

Section 3. Communication Plan

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Specific actions that will be taken to communicate waste management issues throughout the project.
- c. Specific actions that will be taken to communicate the waste management plan and procedures to new employees/subs.
- d. Specify where containers will be placed, how they will be labeled, how waste management practices will be enforced (acceptable and unacceptable items and practices), and how this information will be communicated to the site staff.
- e. Specific procedures and details on how the waste information (what where, how much, who, how) will be documented, organized, and tracked. This includes all waste streams that are returned, salvaged, reused, recycled, and landfilled.
- f. Specific details on how the waste information will be reported to the government (routinely – weekly? monthly? quarterly? and at project closeout – final total details).

Section 4. Expected Waste Streams, Disposal, and Handling (non-hazardous only)

- a. Identification of waste stream (both diverted and landfilled.
- b. Quantity of each type of waste stream identified.
- c. Receiving facility or entity.
 - o Identification of local and regional salvage/reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.
 - o Name of landfill and/or incinerator to be used for waste that are not diverted and the estimated costs for disposal.
- d. Specific site handling procedures.
- e. Identification of transportation method or company.

Example Table Identifying Possible Waste Streams, Quantity, Disposal/Diversion Method, and Handling Procedures

Material	Qty.	Disposal Method (where applicable)	Handling and Transportation Procedure
<i><u>New Construction</u></i>			
Concrete	15 cy		Break up concrete onsite with an excavator, load in trucks and haul to Echo Park Recycle
Forming Boards	6 tons	Reused as many times as possible then recycled to Renu Recycling	Stack next to supply of new form boards for reuse. Recycle clean unusable form in "clean wood" recycling dumpster
Clean Wood Scrap	3 tons	Scraps reused for form work, fire-breaks, etc., then recycled by Renu Recycling	Stack reusable pieces next to dumpster for Reuse. Separate unusable clean wood into "clean wood" recycling dumpster (including wood pallets)
CMUs	75 yds	Henson Masonry to recycle and submit report to recycling coordinator	Will request CMUs that contain recycled Content from supplier
Scrap Metal	5 tons	Renu Recycling Service	Deposit all metals in "metal" dumpster
Acoustical Tile			
Floor Tile			
Carpet Tile			
Gypsum/Wall board			
Cardboard			
Plastic			
Etc.			

Section 5. Hazardous Waste Management Plan (in addition to the requirements above)

Be sure to coordinate Hazmat procedures with Tom Curcio (FL DPW) 253-966-6458.

- a. Types of wastes anticipated to be managed. This should include a discussion of processes which are generating the waste, the volumes anticipated, and the EPA/state waste codes associated with the waste (40 CFR 261, Subpart C and D).
- b. The regulatory status of the waste. In other words, whether the waste is subject to large quantity generator, small quantity generator, or conditionally exempt small quantity generator standards (40 CFR 262.34).
- c. The locations in which wastes will be accumulated will be discussed. This should discuss whether these are 90/180 day accumulation areas, satellite accumulation points, or permitted storage areas. Preferably a map indicating the precise location should be included (40 CFR 262.34).
- d. Inspection requirements. This should discuss what will be inspected, how often it will be inspected, who will conduct the inspection, what the inspection log will contain, and where the inspection records will be retained (40 CFR 262.34, 40 CFR 265.174, and 40 CFR 265.195).
- e. Contingency Planning. Large quantity generators are required to have a contingency plan. Small quantity generators are required to post certain information (40 CFR 262.34 and 40 CFR 265 Subparts C and D).
- f. Marking requirements. This should discuss what type of hazardous waste markings are to be utilized during accumulation (40 CFR 262.32).
- g. Container types. Types of containers used to accumulate hazardous wastes should be identified. Compatibility with the waste being stored should be considered as well as whether the containers will meet packaging requirements for off-site transport (49 CFR 171.178).
- h. Treatment requirements. How will wastes be treated to meet land disposal restrictions (40 CFR 268.40). If elementary neutralization is being performed to render waste non-hazardous, as statement should be included which indicates the activity is being performed under a permit exclusion (40 CFR 270.1(c)(2)(v)).
- i. Disposal requirements. This should discuss whether wastes and/or treatment residues will be disposed in a Subtitle C, hazardous waste disposal facility or in a Subtitle D, nonhazardous waste facility.
- j. Proposed treatment, storage, or disposal facilities (TSDFs). This should provide the name, address, telephone number, and EPA ID number of the TSDFs proposed to be utilized for the waste.
- k. LDR forms, if required. This should provide copies of the LDR forms from the proposed receiving facilities.

Section:

<u>Hazardous Material</u>			
ACM	1500 cyds	XYZ Landfill	Abatement by XXX Abatement Co., transported to landfill by XXX Transport
PCB Ballasts			Stored in drums provided by Ft. Lewis hazmat office at location building XYZ
Flourescent Lamps			
Mercury Switches			
Ozone-Depleting Substances			
Lo-level Rad elements			
Etc.			
Etc.			

APPENDIX DD

Water Quality

Texas Department of Health

BUREAU OF LABORATORIES

CLIA #45D0660644

CONFIDENTIAL LABORATORY REPORT

WATER ANALYSIS REPORT
METALS -

Submitter Identification Number: 0710078

FORT BLISS BIGGS ARMY AIRFIELD
-SDWA PROGRAM MANAGER
ATZC-DOE BLDG 622
FORT BLISS, TX 79916

Laboratory Number: EP216501

Sample Type:

Sample Source:

Entry Points: 001

Collector Remarks:

Date Collected: 10/17/2002

Date Received: 10/18/2002

Date Reported: 11/12/2002

Constituent Name	Result	Units	+/-
Aluminum	<	0.0200 mg/l	
Arsenic	<	0.0068 mg/l	
Barium	<	0.0492 mg/l	
Cadmium	<	0.0010 mg/l	
Calcium	<	18.80 mg/l	
Chromium	<	0.0100 mg/l	
Copper	<	0.0809 mg/l	
Iron	<	0.011 mg/l	
Lead	<	0.0054 mg/l	
Magnesium	<	6.20 mg/l	
Manganese	<	0.0020 mg/l	
Mercury	<	0.0004 mg/l	
Nickel	<	0.0010 mg/l	
Selenium	<	0.0032 mg/l	
Silver	<	0.0100 mg/l	
Sodium	<	110.00 mg/l	
Antimony	<	0.0030 mg/l	
Beryllium	<	0.0010 mg/l	
Thallium	<	0.0010 mg/l	
Zinc	<	0.0321 mg/l	
Total Hardness as CaCO3		72.4 mg/l	



Texas Department of Health

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1100 WEST 49TH STREET
AUSTIN, TEXAS 78756-3194
(512) 458-7318BUREAU OF LABORATORIES
CLIA #45D0660644CONFIDENTIAL LABORATORY REPORT
WATER ANALYSIS REPORT
MINERALS

Submitter Identification Number: 0710078

FORT BLISS BIGGS ARMY AIRFIELD

ATZC-DOE BLDG 622
EL PASO, TX 79916Laboratory Number: EP216498
Sample Type:
Sample Source:
Entry Points: 001
Collector Remarks:Date Collected: 10/17/2002
Date Received: 10/18/2002
Date Reported: 12/19/2002

Constituent Name	Result	Units	+/-
Chloride	70	mg/l	
Fluoride	0.9	mg/l	
Nitrate	1.40	mg/l	
Sulfate	66	mg/l	
pH	7.1		
Dil. Conduct (umhos/cm)	720		
Tot. Alka. as CaCO3	134	mg/l	
Bicarbonate	163	mg/l	
Carbonate	0	mg/l	
Dissolved solids	353	mg/l	
P. Alkalinity as CaCO3	0	mg/l	

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Texas Department of Health

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AUSTIN, TEXAS 78766-3194

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BUREAU OF LABORATORIES
CLIA #45D0660644

CONFIDENTIAL LABORATORY REPORT WATER ANALYSIS REPORT MINERALS

Submitter Identification Number: 0710078

FORT BLISS BIGGS ARMY AIRFIELD

ATZC-DOE BLDG 622
FORT BLISS, TX 79916-0000

Laboratory Number: EP411262
Sample Type:
Sample Source: CMO 1C
Entry Points: 001
Collector Remarks: NITRATE

Date Collected: 05/13/2004
Date Received: 05/14/2004
Date Reported: 05/19/2004

Constituent Name

Nitrate

Nitrite

NOT TESTED - OTHER

Result

Units

1.56 mg/l

Friday, February 19, 2010

+/-

1100 W. 49th Street

Austin, TX 78756

Texas Department of Health

Trihalomethanes by GC-ELCD

Contact: Gary Fest

(512)458-7552

Submitter ID: 0710078
TDH Lab ID: EP04-11271
Method: EPA 502.2 Rev. 2.1 (THM)
Data File: 05170019.D
QC File: D:\HPCHEM\1\DATA\IO01G0517
Sample Type: Water

Date Collected: 05/13/2004
Date Prepared: 05/17/2004
Date Analyzed: 05/17/2004 8:50
Analyst: M. Gerlach
Dilution Factor: 1
Concentration Units: µg/l

Compound:**Result:**

Chloroform
Bromodichloromethane
Dibromochloromethane
Bromoform
Total THM's

< 2.0
< 2.0
< 2.0
< 2.0
< 8.0

COMMENTS:Approval: 

Friday, February 19, 2010

MAY 19 2004

**Texas Department of Health
Haloacetic Acids GC Results**

Contact: Gary Fest

(512) 458-7552

Submitter Sample Number 0710078
TDH Sample Name EP4-11294
Method 552.2
Data File Name 0519023.D
QC File C:\MSDCHEM\2\DATA\O18P0519\
Sample Type Water

Date Collected 5/13/2004
Date Extracted 5/18/2004
Date Analyzed 5/20/2004 4:17
Analyst M. Kabay
Dilution Factor 1
Concentration Units $\mu\text{g/L}$

Regulated Compounds:**Result:**

Monochloroacetic acid	<2.0
Dichloroacetic acid	<1.0
Trichloroacetic acid	<1.0
Monobromoacetic acid	<1.0
Dibromoacetic acid	<1.0
Total:	<6.0

Monitor Compounds:

Bromochloroacetic acid	<1.0
Dalapon	<1.0

Comments:

Approval: 

Friday, February 19, 2010

MAY 21 2004



Texas Department of Health

BUREAU OF LABORATORIES
CLIA #45D0660644

CONFIDENTIAL LABORATORY REPORT WATER ANALYSIS REPORT RADIOCHEMICALS

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1100 WEST 49TH STREET
AUSTIN, TEXAS 78756-3194
(512) 458-7318

Submitter Identification Number: 0710078

FORT BLISS BIGGS ARMY AIRFIELD

ATZC-DOE BLDG 622
EL PASO, TX 79916

Laboratory Number: EP216503

Sample Type:

Sample Source:

Entry Points: 001

Collector Remarks:

Date Collected: 10/17/2002
Date Received: 10/18/2002
Date Reported: 04/01/2003

Constituent Name	Result	Units	+/-
Radium 226	< 0.2	pCi/l	
Radium 228	1.5	pCi/l	
Gross Beta	9.3	pCi/l	1.3
Gross Alpha Particle Activity	4.6	pCi/l	1.4

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APPENDIX EE

CorrShield NT 402

**GE Betz**

GE Betz, Inc.
4636 Somerton Road
Trevose, PA 19053
Business telephone: (215) 355-3300

Material Safety Data Sheet

Issue Date: 01-SEP-2004

EMERGENCY TELEPHONE (Health/Accident): (800) 877-1940

1 PRODUCT IDENTIFICATION

PRODUCT NAME:

CORRSHIELD NT402

PRODUCT APPLICATION AREA:

CORROSION INHIBITOR.

2 COMPOSITION / INFORMATION ON INGREDIENTS

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

CAS#	CHEMICAL NAME
7632-00-0	SODIUM NITRITE Oxidizer; toxic (by ingestion); potential blood toxin
12179-04-3	BORIC ACID,DISODIUM SALT,PENTAHYDRATE Irritant (abraded skin); slight irritant (respiratory)

No component is considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer, or the Occupational Safety and Health Administration at OSHA thresholds for carcinogens.

3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW**WARNING**

May cause moderate irritation to the skin. Severe irritant to the eyes. Mists/aerosols cause irritation to the upper respiratory tract.

DOT hazard: Toxic Liquid, RQ
Emergency Response Guide #151
Odor: Slight; Appearance: Yellow, Liquid

Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media:
Flood with water. Use of CO2 or foam may not be effective.

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:

Primary route of exposure; May cause moderate irritation to the skin.

ACUTE EYE EFFECTS:

Severe irritant to the eyes.

ACUTE RESPIRATORY EFFECTS:

Mists/aerosols cause irritation to the upper respiratory tract.

INGESTION EFFECTS:

Toxic;
May cause gastrointestinal irritation with possible nausea, vomiting, headache, dizziness, unconsciousness and injury to the kidneys and liver.

TARGET ORGANS:

Prolonged or repeated exposures may cause CNS depression and/or toxicity to the liver, kidney, and blood system.

MEDICAL CONDITIONS AGGRAVATED:

Not known.

SYMPTOMS OF EXPOSURE:

May cause redness or itching of skin.

4 FIRST AID MEASURES

SKIN CONTACT:

Wash thoroughly with soap and water. Remove contaminated clothing. Thoroughly wash clothing before reuse. Get medical attention if irritation develops or persists.

EYE CONTACT:

Remove contact lenses. Hold eyelids apart. Immediately flush eyes with plenty of low-pressure water for at least 15 minutes. Get immediate medical attention.

INHALATION:

If nasal, throat or lung irritation develops - remove to fresh air and get medical attention.

INGESTION:

Do not feed anything by mouth to an unconscious or convulsive victim. Dilute contents of stomach. Induce vomiting by one of the standard methods. Immediately contact a physician.

NOTES TO PHYSICIANS:

No special instructions

5 FIRE FIGHTING MEASURES

FIRE FIGHTING INSTRUCTIONS:

Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:

Flood with water. Use of CO2 or foam may not be effective.

HAZARDOUS DECOMPOSITION PRODUCTS:

Thermal decomposition (destructive fires) yields elemental oxides.

FLASH POINT:

> 200F > 93C P-M(CC)

MISCELLANEOUS:

Toxic Liquid, RQ

UN3287;Emergency Response Guide #151

6 ACCIDENTAL RELEASE MEASURES

PROTECTION AND SPILL CONTAINMENT:

Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:

Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7 HANDLING & STORAGE

HANDLING:

Contains an oxidizer. Avoid all contact with reducing agents, oils, greases, organics and acids. Do not allow to dry.

STORAGE:

Keep containers closed when not in use. Protect from freezing.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS**CHEMICAL NAME****SODIUM NITRITE**

PEL (OSHA): NOT DETERMINED

TLV (ACGIH): NOT DETERMINED

BORIC ACID, DISODIUM SALT, PENTAHYDRATE

PEL (OSHA): NOT DETERMINED

TLV (ACGIH): 1 MG/M3

ENGINEERING CONTROLS:

Adequate ventilation to maintain air contaminants below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.
USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.
If air-purifying respirator use is appropriate, use a respirator with dust/mist filters.

SKIN PROTECTION:

rubber gloves-- Wash off after each use. Replace as necessary.

EYE PROTECTION:

splash proof chemical goggles

9 PHYSICAL & CHEMICAL PROPERTIES

Specific Grav.(70F,21C)	1.250	Vapor Pressure (mmHG)	~ 18.0
Freeze Point (F)	< < 0	Vapor Density (air=1)	< 1.00
Freeze Point (C)	< -18		
Viscosity(cps 70F,21C)	12	% Solubility (water)	100.0

Odor	Slight
Appearance	Yellow
Physical State	Liquid
Flash Point	P-M(CC) > 200F > 93C
pH As Is (approx.)	11.6
Evaporation Rate (Ether=1)	< 1.00

NA = not applicable ND = not determined

10 STABILITY & REACTIVITY

STABILITY:

Stable under normal storage conditions.

HAZARDOUS POLYMERIZATION:

Will not occur.

INCOMPATIBILITIES:

May react with strong oxidizers.

DECOMPOSITION PRODUCTS:

Thermal decomposition (destructive fires) yields elemental oxides.

INTERNAL PUMPOUT/CLEANOUT CATEGORIES:

"B"

11 TOXICOLOGICAL INFORMATION

Oral LD50 RAT:	~275 mg/kg
NOTE - Estimated value	
Dermal LD50 RABBIT:	>5,000 mg/kg
NOTE - Estimated value	

12 ECOLOGICAL INFORMATION

AQUATIC TOXICOLOGY

Ceriodaphnia 48 Hour Static Renewal Bioassay
LC50= 61; No Effect Level= 15.6 mg/L
Daphnia magna 48 Hour Static Renewal Bioassay pH of test solutions was adjusted to a level of 6-9.
LC50= 100; No Effect Level= 38 mg/L
Fathead Minnow 96 Hour Static Renewal Bioassay
LC50= 1072; No Effect Level= 500 mg/L
Rainbow Trout 96 Hour Static Acute Bioassay
LC50= 180; No Effect Level= 100 mg/L

BIODEGRADATION

BOD-28 (mg/g): 1
BOD-5 (mg/g): 0
COD (mg/g): 79
TOC (mg/g): 4

13 DISPOSAL CONSIDERATIONS

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is :
Not applicable.

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14 TRANSPORT INFORMATION

DOT HAZARD: Toxic Liquid, RQ
UN / NA NUMBER: UN3287
DOT EMERGENCY RESPONSE GUIDE #: 151

15 REGULATORY INFORMATION

TSCA:

All components of this product are listed in the TSCA inventory.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):

32 gallons due to SODIUM NITRITE;

SARA SECTION 312 HAZARD CLASS:

Immediate(acute);Delayed(Chronic)

SARA SECTION 302 CHEMICALS:

No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:

CAS#	CHEMICAL NAME	RANGE
7632-00-0	SODIUM NITRITE	21.0-30.0%

CALIFORNIA REGULATORY INFORMATION

CALIFORNIA SAFE DRINKING WATER AND TOXIC

ENFORCEMENT ACT (PROPOSITION 65) CHEMICALS PRESENT:

No regulated constituents present

MICHIGAN REGULATORY INFORMATION

No regulated constituent present at OSHA thresholds

16 OTHER INFORMATION

NFPA/HMIS

CODE TRANSLATION

Health	2	Moderate Hazard
Fire	0	Minimal Hazard
Reactivity	0	Minimal Hazard
Special	NONE	No special Hazard
(1) Protective Equipment	B	Goggles,Gloves

(1) refer to section 8 of MSDS for additional protective equipment recommendations.

CHANGE LOG

	EFFECTIVE DATE -----	REVISIONS TO SECTION: -----	SUPERCEDES -----
MSDS status:	13-FEB-1997		** NEW **
	23-JUN-1997		13-FEB-1997
	16-NOV-2001	15	23-JUN-1997
	09-OCT-2002	12	16-NOV-2001
	10-OCT-2002	4,16	09-OCT-2002
	26-NOV-2002	12	10-OCT-2002
	01-SEP-2004	3,5,14	26-NOV-2002

APPENDIX FF

FORT BLISS ACCESS CONTROL POLICY



DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BLISS
1 PERSHING ROAD
FORT BLISS, TX 79916-3803

December 27, 2006

REPLY TO
ATTENTION OF:

Office of the Garrison Commander

Dear Fort Bliss Business Partner:

Fort Bliss continues to take steps to ensure the safety of our personnel, facilities, vendors, suppliers, contractors, service providers and visitors on our post. Effective February 1, 2007, Fort Bliss is instituting a new standardized entry protocol called the *RAPIDGate*™ Program for all new and existing vendors, suppliers, contractors and service providers (companies) who require routine access to Fort Bliss. The *RAPIDGate* Program is one of several steps Fort Bliss is undertaking to comply with Homeland Security Presidential Directive 12 (HSPD-12). The *RAPIDGate* Program, provided by Eid Passport, Inc., will provide a standardized background check, an identification badge and entry procedure that improves security while at the same time significantly speeding up entry for participating companies.

Companies participating in the *RAPIDGate* Program will be able to enter Fort Bliss through any of the 8 currently open gates (Cassidy, Sheridan, Marshal, Chaffee, Remagan, Robert E. Lee, Jeb Stuart South, and Pershing) without having to stop and obtain a day pass. Of course, due to the size constriction of some vehicles, larger vehicles in the size of semi-truck or larger will be only allowed to enter through the Cassidy, Sheridan, Chaffee, and Robert E. Lee access points. Companies can enroll in the *RAPIDGate* Program by calling 1-877 *RAPIDGATE* (1-877-727-4342). Once enrolled, employees can register at the self-service Registration Stations located at the Chaffee Gate, Bldg. 505 (Vehicle Registration) or the BAAF Main Gate. Based on the information collected at the self-service Registration Station, the *RAPIDGate* Program runs a 10-year felony background screen, other criminal screens, and validates the social security number. The *RAPIDGate* Program also verifies that the individual is either a U.S. Citizen or is legally eligible to work in the United States. Upon passing the screening process, participants will be issued a personalized *RAPIDGate* identification badge that when verified by a security officer will allow the participant to enter Fort Bliss without having to sign in for a day pass. The *RAPIDGate* identification badge will be valid for a period of twelve (12) months. Your company will be given an opportunity at the end of the 12 month period to renew enrollment in the program. Fort Bliss will no longer accept background checks from other sources beginning February 1, 2007.

Companies that chose not to participate in the *RAPIDGate* Program will be allowed access only through the Fort Bliss Chaffee (Commercial) Gate where, before entering the installation, these personnel will be required to obtain a day pass at the Chaffee Pass Office. To receive the one day pass, you will need to park your vehicle and have all occupants enter the gate pass office to sign in, individually, for the day pass. All vehicle occupants must be prepared to provide a government issued photo ID, and the driver of the vehicle will be required to provide proof of

Friday, February 19, 2010

vehicle registration, proof of insurance, and a state issued drivers license. Extended Passes will no longer be available beginning February 1, 2007 while currently issued extended passes will be honored until their expiration date.

The *RAPIDGate* Program not only saves you time, but also increases the safety and security for Fort Bliss and all personnel who work on the base. We encourage your participation in the *RAPIDGate* Program. Please note, *RAPIDGate* participants are still subject to random inspections.

To enroll, please follow the guidelines on the attached document (*RAPIDGate* Program Enrollment Information). Questions about the Fort Bliss *RAPIDGate* program should be addressed to info@rapidgate.com with the subject line RE: *RAPIDGate* Program.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. T. Burns', is positioned above the printed name.

Robert T. Burns
Colonel, US Army
Commanding

Forms of Acceptable Identification

List A – One Needed

- U.S. Passport (unexpired or expired)
- Certificate of U.S. Citizenship (Form N-560 or N-561)
- Certificate of Naturalization (Form N-550 or N-570)
- Unexpired foreign passport, with I-551 stamp or attached Form I-94 indicating unexpired employment authorization
- Permanent Resident Card or Alien Registration Receipt Card with photograph (Form I-151 or I-551)
- Unexpired Temporary Resident Card (form I-688)
- Unexpired Employment Authorization Card (Form I-688A)
- Unexpired Reentry Permit (Form I-327)
- Unexpired Refugee Travel Document (Form I-571)
- Unexpired Employment Authorization Document issued by DHS that contains a photograph (Form I-688B)

List B – Two Needed

- Driver's license or ID card issued by a state
- ID Card issued by federal, state or local government agencies or entities
- School ID card with a photograph
- Voter's registration card
- U.S. Military card or draft record
- Military Dependent's ID card
- U.S. Coast Guard Merchant Mariner Card
- Native American tribal document
- Driver's license issued by a Canadian government authority
- U.S. Social Security card issued by the Social Security Administration
- Certification of Birth Abroad issued by the Department of State (Form FS-545 or Form DS-1350)
- Original or certified copy of a birth certificate issued by a state, county, municipal authority or outlying possession of the United States bearing an official seal
- Native American tribal document
- U.S. Citizen ID Card (Form I-197)
- ID Card for use of Resident Citizen in the United States (Form I-179)
- Unexpired employment authorization document issued by DHS (other than those listed under List A)

RAPIDGate Program Enrollment Information

Enroll your company by calling Eid Passport at 1-877-*RAPIDGATE* (1-877-727-4342) and provide a Fort Bliss sponsor point of contact that includes a name, phone number, and e-mail address. Once your request is received, final authorization to participate in the *RAPIDGate* Program will be granted by the Fort Bliss Office of the Provost Marshal.

Once your company has been approved for enrollment and paid the enrollment fee, instruct your employees who need access to Fort Bliss to register for the *RAPIDGate* Program using the self-service Registration Station located within the Chaffee Gate Pass Office, Bldg. 505 (Vehicle Registration Office) or the BAAF Main Gate Pass Office. Each employee should be ready to provide your company's *RAPIDGate* company code, his or her address, phone number, date of birth, and Social Security number for proof of identification and background screening. The Registration Station will capture the employees photograph and fingerprints for identity verification and badging during the application process.

Once your company has approved each employee for participation, and paid the registration fee, the employee will undergo a background screen. Upon passing the screen, your company will be notified to send the employee to pickup their personalized *RAPIDGate* Badge at the Fort Bliss Vehicle Registration Office located within bldg. 505. The employee will be required to show identification at the time of badge pickup. The employees can show one form of identification from List A, or two forms of identification from List B. Please see last page for listing.

Once a *RAPIDGate* Badge is issued, employees will be required to present their Badge to gain entry to Fort Bliss, and must wear and display the Badge at all times while on the premises. Questions about the Fort Bliss *RAPIDGate* program should be addressed to info@rapidgate.com with the subject line RE: *RAPIDGate* Program.

Continuation -

Due to ongoing construction on Fort Bliss, Biggs AAF, and WBAMC several temporary access gates have been constructed to facilitate entry onto the cantonments. The additional access gates are not included within the Letter To Vendors due to their temp status and their construction after the letter was issued. The additional access gates, located on Biggs AAF, are Global Reach ACP, General Harmon ACP and IBCT ACP. These listed temp access gates will follow the same access control procedures as outlined for all members of the Rapid Gate system. Please be advised that, due to their temporary construction status, care should be taken when attempting access with larger than standard sized vehicles. These temp access gates are constructed with 10' to 12' in width paved traffic lanes and an overhead clearance of no less than 14.5'. Traffic speed limits upon approaching, entering, and leaving the temp access gates are listed as 15mph.

APPENDIX GG

Site Structures and Amenities

Update
February 2009

- Walls and Fences
- Trash Receptacles
- Dumpsters
- Flagpoles
- Movable Planters
- Bicycle Racks
- Tree Grates
- Bollards
- Play Equipment
- Mailboxes
- Monuments, Memorials, Military Equipment Static Displays
- Drinking Fountains

11.3.3 Seating

Seating includes benches and walls, as well as tables and movable chairs.

11.3.3.1 Benches

11.3.3.1.1 Bench Location. Benches should be located in areas of high pedestrian use, and arranged to encourage socialization within a pleasant outdoor setting. This includes pedestrian nodes along primary walkways, at major building entryways, courtyards, and at bus stops.

11.3.3.1.2 Bench Siting. Benches should be sited on concrete pads adjacent to walkways. Provide proper clearance around benches, a minimum 2'0" setback from adjacent sidewalks and a minimum of 5'0" between front of bench and any stationary obstacle. Provide appropriate planting treatment for visual definition and seasonal shade.

11.3.3.1.3 Bench Design. Pre-Cast Concrete or Metal Benches. Pre-cast concrete or metal benches, with or without backs, are appropriate for the informal gathering, resting, eating and waiting uses characteristic of community facility areas. Standard bench size should be 6'-0" long. Metal support base should have a dark brown factory finish to match standard trim color. Wall mounted benches should be similar in style and color to free standing benches.

Update
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11.3.3.2 Seating Walls

11.3.3.2.1 Seating Walls Location. Wherever possible, seating should be incorporated into planter boxes (Fig. 11.4) or retaining walls, particularly at building entrance areas. Seating walls should be integrated into the overall area design and the pedestrian circulation system.

11.3.3.2.2 Seating Wall Design. Seating walls should generally be between 18" and 22" high, 12" to 18" wide, and constructed of rock wall, textured concrete, or brick in a manner to complement or match the materials of the adjacent buildings.

11.3.3.3 Tables.

11.3.3.3.1 Locate tables together with seating that is oriented to the user needs of socializing, relaxing, or eating in less formal spaces with a pleasant setting and attractive view.

11.3.3.3.2 Table Location. Small groupings of tables in high visibility areas should be placed within proximity of recreation or food service facilities. These groupings should be located on hard pavement areas adjacent to walkways. Pavement should be constructed of exposed aggregate, broom finish concrete, or pavers. Incorporate tree plantings and overhead trellis structures within these areas to provide shade and spatial definition.

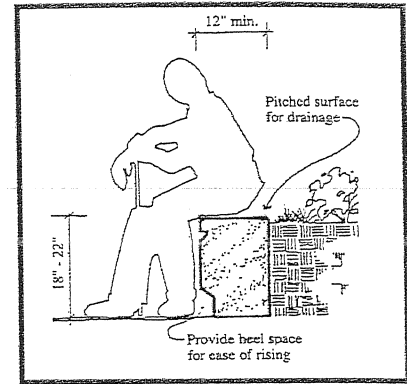


Figure 11.4 - Retaining Wall / Seating.

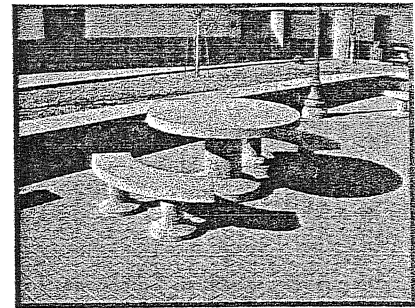


Fig. 11.5 – Seating Incorporated Into Planter Box at Dining Facility

11.3.4 Telephone Booths

Telephone booths should be incorporated into building architecture, utilizing building recesses and overhangs, or integrated into bus or other shelters. Provide a minimum 3'0" clearance between booths and the edge of walkways. All service line wiring should be underground or concealed. Booths should be equipped with lighting for nighttime use. In sheltered areas, use standard wall-mounted phone enclosures.

11.3.5 Shelters

11.3.5.1 There are many different types of shelters on military installations. Shelters are provided for those waiting for buses, and in areas where people congregate to socialize or eat such as in courtyards or picnic areas.

11.3.5.1.1 Bus Shelters

11.3.5.1.1.1 Bus Shelter Location. Bus shelters should be located at major facilities along the bus route such as Commissary/Post Exchange areas, barracks areas, hospital, and library. Bus stops should relate to major pedestrian walkways, and be placed on concrete pads. Provide a minimum 3'0" clearance between shelters and the edge of walks.

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11.3.5.1.1.2 Bus Shelter Design. Bus shelter design typically should be simple and consistent throughout the post, matching the existing units in terms of materials, scale, and detail (Fig. 11.6). The shelters should include an integral bench, and trash receptacle.

11.3.5.1.2 Picnic Shelters

11.3.5.1.2.1 Picnic Shelter Location. Picnic shelters should be strategically located and sized for shared use to discourage the proliferation of small shelters scattered throughout the installation.

11.3.5.1.2.2 Picnic Shelter Design. Picnic shelters can be open on all sides. The minimum size should be 20 feet square with a minimum 8-foot vertical clearance.

11.3.6 Kiosks

11.3.6.1 Kiosk Location

Kiosks can be used as information centers at pedestrian nodes within the town center. Provide kiosks only where they are needed on a concrete base adjacent to walkways. Allow a minimum of 3' clearance on all sides.

11.3.6.2 Kiosk Design

Kiosk design should blend compatibly with other site furnishings and with the architectural character of the zone in terms of form, scale, and materials. A similar design treatment should be established for kiosks and shelters.

11.3.7 Walls and Fences

11.3.7.1 Location and Use

Walls and fencing should be used to provide visual screening, define pedestrian plaza areas, wind screening, pedestrian and vehicular control, security, and to retain soil. The design of walls and fences should fulfill their function in harmony with the character and appearance of their setting.

11.3.7.2 Walls

Low walls should be used to define pedestrian courtyard areas and provide informal seating. Screening walls can be used where appropriate to screen building service areas. Walls adjacent to walkways should be free of any projections, such as signs or drain pipes that

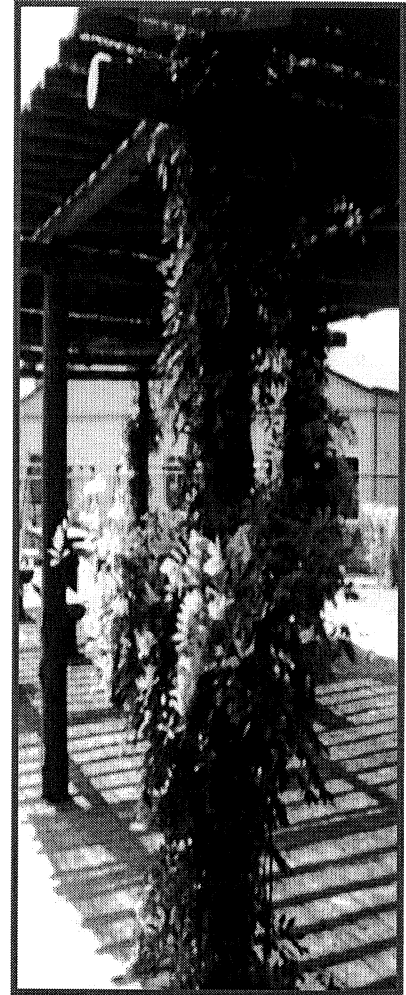


Fig. 11.6 - Trellis and Vines Provide Shelter.

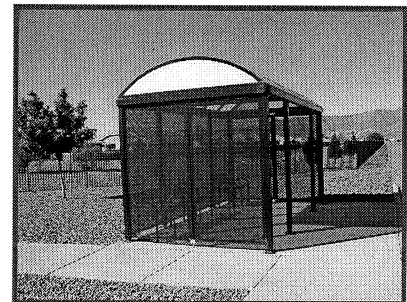


Fig. 11.7 – Typical Fort Bliss Bus Shelter.

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would pose a hazard to passing pedestrians. Construction of walls should incorporate either rock wall, brick to match adjacent buildings, with stone or concrete cap, or concrete with a textured finish and stone or concrete cap. Retaining walls (Fig. 11.8) may be constructed of native stone, brick, versa-lock modular stone with a light tan finish, or concrete block with a light tan stucco finish, concrete block planters, or other appropriate material.

11.3.7.3 Fences

Rock wall or other masonry fences should be utilized for screening of service areas and site utilities, particularly dumpsters. Chain link fences should be screened with trees and shrubs. The use of chain link fence should be held to a minimum in the cantonment area.

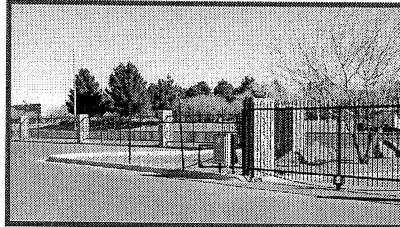


Fig. 11.9 – Wrought Iron Fence

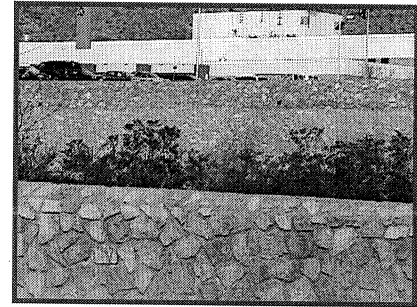


Fig. 11.8 - Indigenous Stone Retaining Wall

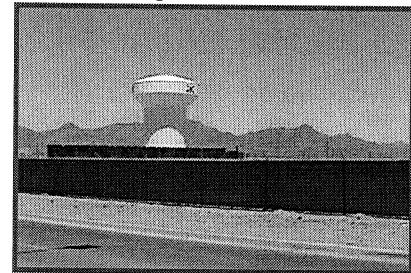


Fig. 11-10 – Chain Link Fence With Green Fabric Screening

11.3.7.3.1 Use of wrought iron fence where appropriate (Fig. 11.9).

11.3.7.3.2 Use chain link with green color fabric for storage yards and other appropriate areas (Fig. 11.10).

11.3.8 Trash Receptacles

11.3.8.1 Trash Receptacle Location

Trash containers should be highly visible and accessible for effective litter control. Containers should be located conveniently along walkways, near major pedestrian intersections, near building entrances and near seating and eating areas. Antiterrorism/force protection requirements restrict the location of dumpsters to a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) from billeting and primary gathering areas (*Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings*, Table B-1).

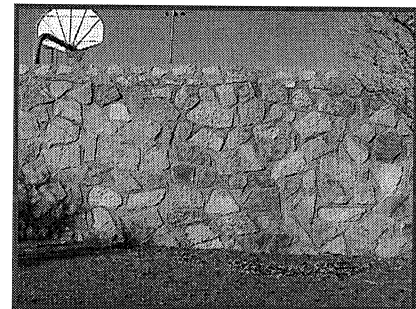


Fig. 11.11 - Six Foot Rock Wall

11.3.8.2 Trash Receptacle Design – Not Used

11.3.8.3 Trash Receptacle Type - Not Used

11.3.8.4 Dumpsters

11.3.8.4.1 Dumpster Location

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The location of dumpsters can have a significant visual impact, and should therefore be addressed as part of an overall building design and incorporated in site planning. To the greatest extent possible, incorporate dumpster placement into areas screened with walls. Avoid locating dumpsters along major circulation routes or use areas. Dumpsters should be directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Antiterrorism/force protection requirements restrict the location of dumpsters to a minimum of 10 meters (33 feet) from inhabited buildings and 25 meters (82 feet) from billeting and primary gathering areas (Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, Table B-1).

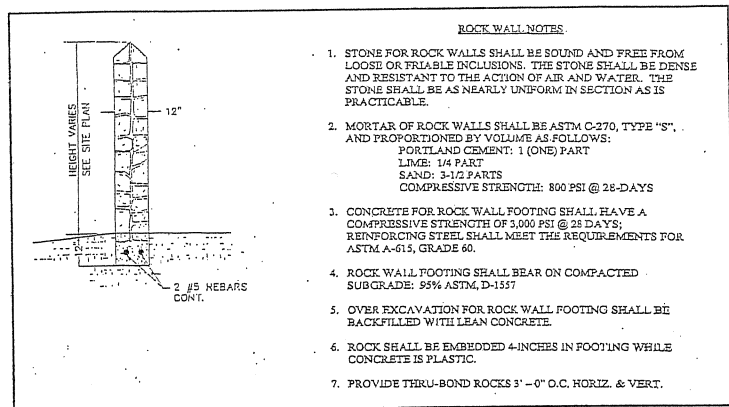


Fig. 11.12 – Construction Detail for Six Foot Rock Wall

11.3.8.4.2 Dumpster Site Design

Rock walls shall be 6' in height. All dumpsters should be placed on 12' x 12' concrete pads with aprons large enough to encompass the bearing points of the service vehicle (Fig. 11.12).

11.3.9 Flagpoles

The standard flagpole for Fort Bliss shall be tapered mill finish aluminum, fitted with a gold anodized finish "ball" finial (Fig. 11.13). The mounting detail should be simple with a concrete base flush at grade. A concrete pad should be used when poles are located in lawn areas. In plaza areas, flagpole locations and mounting detail should be integrated into the paving pattern. Flagpoles should include lighting and may be accented with planting beds around the base of the flagpole.

11.3.10 Planters

11.3.10.1 Movable pre-cast concrete planters may be used outside building entrances to provide seasonal color and interest and function as security threat barriers (Fig. 11.14).

Planters should be located so they impede vehicular access to a building, but not so they excessively impede pedestrian movement. Several planters of various sizes may be grouped together to produce an aesthetically pleasing display.

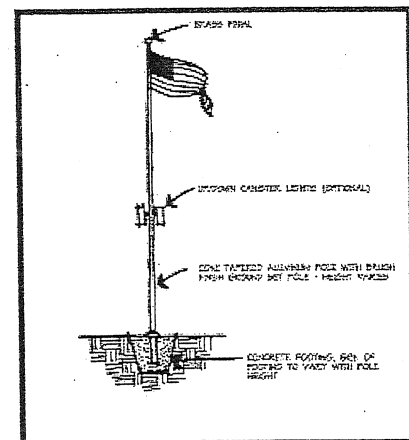


Fig. 11.13 – Standard Flagpole

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11.3.11 Bicycle Racks

Bicycle racks should be provided at key destination locations. They should be located on a concrete surface where they will not impede pedestrian movement or block building entrances.

A ribbon type tubular aluminum bike rack with an anodized dark bronze finish is the post standard (Fig. 11.15). Bicycle storage areas near barracks should be covered.

11.3.12 Tree Grates

Tree grates should be used when installing trees in large paved areas such as pedestrian plazas, walks, and ceremonial entrance courts. Tree grates and planting pits should be a minimum of 5'x 5'.

11.3.13 Bollards

Bollards are utilized to separate vehicular and pedestrian traffic, to direct access, or as decorative elements in pedestrian areas.

11.3.14 Playgrounds/Tot Lots

11.3.14.1 Installation playgrounds and tot lots should use equipment that is consistent throughout the installation or that meets specific criteria of materials, color, and design (Fig 11.16).

11.3.14.2 Playground Planning and Design

Guidance for planning and designing unsupervised outdoor play areas that meet child safety and child development requirements is found in Unified Facilities Criteria (UFC) 3-210-04, Design: Children's Outdoor Play Areas. The guidance given in this publication meets the needs of children with and without disabilities.

11.3.14.3 Playground Inspection and Maintenance

A play area inspection and maintenance program for Child Development Centers can be found in Technical Manual (TM) 5-663, Child Development Center, Play Area Inspection and Maintenance Program.

11.3.14.4 Recalled and Banned Playground Equipment

For updates on banned or recalled playground equipment consult the Consumer Product Safety Commission Press Releases and Recalls web site.

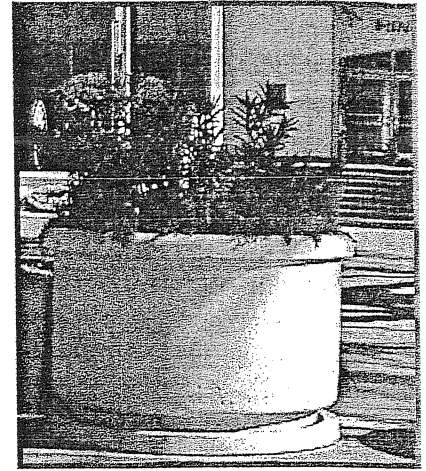


Fig. 11-14 – Movable Precast Concrete Planter

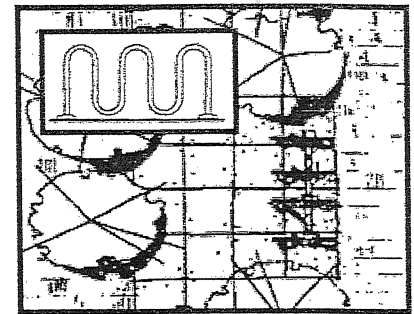


Fig. 11.15 – Bicycle Rack System

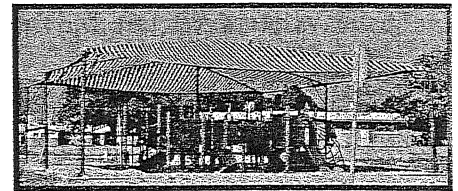


Fig. 11.16 - Playground and Tot Lot With Canopy For Shade

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Table 11.5.4 Lighting Design Matrix

		TYPICAL AREAS OF LIGHTING USE																		
TYPE		Entry Gates	Primary Roadways	Secondary Roadways	Tertiary Roadways	Primary Walkways/Bikeways	Secondary Walkways/Bikeways	Tertiary Walkways/Bikeways	Courtyards	Playgrounds	Ball fields	Basketball Courts	Tennis Courts	Buildings	Landscaping	Fence Perimeters	Signs & Monuments	Large Parking Lots	Small Parking Lots	Training areas
	Compact Fluorescent	•												•	•		•			
	Metal Halide	•							•	•	•	•	•		•	•	•			•
	High Pressure Sodium	•	•	•	•	•	•	•		•				•		•		•	•	•
LEVEL	Lux (lx)		20	15	10	10	2		50		200	200	50							
	Foot-candles (fc)		2	1.4	0.9	0.9	0.2		5		10	20	5.6			0.2		1	1	1
HEIGHT	30' Max	•	•	•	•									•	•			•		
	25' Max					•	•	•											•	
	15' Max																			
	Varies								•	•	•	•	•			•	•			•
FIXTURE	Cutoff	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Utility													•		•				•
	Bollard																			
	Spot																•			
	Wall Mount													•						
POLE	Metal	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	
	Wood															•				•
SPACING	120' Max		•	•	•												•		•	
	90' Max																		•	
	Varies													•			•			•

• = Appropriate usage

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11.6.6.4 Fire hydrants should be highly visible and free of any screening. They shall be nutmeg brown in color with luminous paint. Cap color shall indicate tested water pressure (Fig. 11.37).

Each fire hydrant shall include an antiterrorism check valve (ATV) designed to protect against accidental backflow and intentional contamination of drinking water via the hydrant. The ATV shall be a stealth check valve located internal to the upper barrel of the hydrant and shall consist of four main parts:

- A sleeve-insert valve seat, made of E coated or fusion bonded epoxy steel. The top of the valve seat shall have a machined slot to accommodate an EPDM quad ring which will provide an impenetrable seal between the seat and the valve.
- A valve made of brass with machined slots to accommodate an o-ring between the valve and the upper stem.
- A stainless steel machined upper stem will replace the original upper stem. The brass valve shall be attached to the upper stem in such a manner as to provide free vertical movement along the shaft.
- A stainless steel spring that shall fit around the upper stem and be of adequate compression strength and length that sufficient pressure is placed on the valve to provide an impenetrable seal when the hydrant is not in use and yet allow water to flow freely when the hydrant is flowed.
- The ATV shall be installed by a manufacturer certified technician.



Fig. 11.37 - Fire Hydrants Shall Be Nutmeg Brown. Cap Color Shall Indicate Tested Water Pressure.

11.6.7 Storm Drainage

11.6.7.1 Installation storm drainage systems should be appropriate to the character of development they serve. Storm drainage systems in densely developed areas require curbs, gutters, and underground lines. Storm drainage systems in low-density areas can utilize drainage swales and ditches that are contoured to be compatible with the natural landform. Where retention ponds are required, they should be designed to appear as a natural amenity that is part of the natural contour of the land, rather than a square or rectangular hole in the ground. Retention ponds that are designed to be dry most of the time can be utilized for recreational purposes or as open space. In either case, the areas should be designed to conform to the natural contours of the land. A recreational field that is an integral part of a Primary Facility, however, cannot be used as a retention pond.

11.6.7.2 Large hard surfaced parking lots should have covered drainage at the entry to prevent water draining into adjacent streets.

APPENDIX HH

SUBMITTAL DISTRIBUTION MATRIX

Activity & Address	Drawing Size		Design Analysis	Specs	CD - D.A , specs .pdf & CADD,.dwg	Furniture, Furnishings & Equipment Submittal	Structural Interior Design Submittal
	Full	Half Size					
US Army Corps of Engineers ATTN: Kevin S. Weber CESWT-PP-M 1645 S. 101st E Ave. Tulsa, OK 74128 918-669-7060	1	8	8	8	8	2	2
US Army Corps of Engineers ATTN: Frank Covington/ Ron Soule, PMs CESWF-PM-J 819 Taylor Street Ft. Worth, TX 76102 817-338-8668	0	0	0	0	2	0	0
US Army Corps of Engineers ATTN: Resident Engineer Bldg , Office Street Address Ft. Bliss, TX 79916 915- -	0	4	4	4	4	2	2
Directorate of Public Works IMSW-BLS-DPW-MP ATTN: Andres Iglesias Bldg 777, Office 114 Pleasanton Rd. Ft. Bliss, TX 79916 915-568-5949	0	1	1	1	3	2	2
IMSW-BLS-Z ATTN: John Barrera Bldg 624 Pleasanton Ave. Ft. Bliss, TX 79916-6816 (915) 568-3908	0	1	0	1	1	0	0
Physical Security Office ATZC-PM ATTN: Thomas Cain Bldg 116, Pershing Road Ft. Bliss, TX 79916	0	1	1	1	1	0	0
DOIM ATTN: Thomas Hopkins Bldg 58, Doniphan Road Ft. Bliss, TX 79916 (915) 568-8194	0	1	1	1	1	0	0
FESD, DES ATTN: James L. Narlock Building 11211 Wright Street Ft. Bliss, TX 79916 (915) 744-9896	0	0	0	0	3	0	0
IMWE-BLS-PWM ATTN: Ricardo Cortez Bldg 777, Rm 319 Pleasanton Ave.Fort Bliss, TX 79916-6812 (915) 568-5201	0	3	1	1	7	0	0
Installation Safety Office ATZC-CSS Attn: Dennis I. Ostrander Bldg 515-B 1733 Pleasanton Road Ft. Bliss, TX 79916-6812	0	1	1	1	1	0	0

Activity & Address	Full	Half Size	Design Analysis	Specs	CD - D.A , specs .pdf & CADD,.dwg	Furniture, Furnishings & Equipment Submittal	Structural Interior Design Submittal
DPTMS, P&O (IOC) ATTN: Ron Wells AT/FP Antiterrorism Officer 2 Sheridan Road Fort Bliss, TX 79916 (915)569-8663	0	1	1	1	2	0	0
JLENS End User ATTN: Streeet Address Ft. Bliss, TX 915- -	0	2	0	0	3	0	0
THAAD End User Director, CTM Upper Tier ATTN: ATSA-TCM-UT Dan Hardwick / Ramiro Pinedo 12 Pershing Rd Ft. Bliss, TX 79916-3802 915-568-7242	0	2	0	0	3	0	0
Sustainment Brigade End User ATTN: Streeet Address Ft. Bliss, TX 915- -	0	2	0	0	3	0	0
Public Works Division IMA, SW Region ATTN: Greg Kish 2450 Stanley Road, Suite 101 Ft. Sam Houston, TX 78234-6102 210-295-2287	0	1	0	1	1	0	0
USAISEC-FDED ATTN: AMSEL-IE-DE-IN-OP George Gaffney 1435 Porter St, Suite 230 Fort Dietrick, MD 21702 301-619-6501	0	1	1	1	1	0	0
US Army Corps of Engineers ATTN: Phil Brinson CESAS-EN-DA 100 W. Oglethorpe Ave.Pleasanton Rd. Savannah, GA 31401-3640 912-652-5566	0	1	1	1	3	0	0
Jacobs ATTN: Cecil Penn 777 Main Street Ft Worth, TX 76102 817-735-7018	0	2	2	2	3	1	1
Huitt Zollars ATTN: Blanca Berumen 3131 McKinney Ave, Suite 600 Dallas, TX 75204-2489 214-871-3311	0	1	1	1	1	0	0

Activity & Address	Full	Half Size	Design Analysis	Specs	CD - D.A , specs .pdf & CADD,.dwg	Furniture, Furnishings & Equipment Submittal	Structural Interior Design Submittal
Jacobs-Huitt Zollars ATTN: Catherine Zultner P140A - Annex Corner of Velez St & Sapper St Ft. Bliss, TX 79906 214-708-2845	0	1	1	1	1	1	1

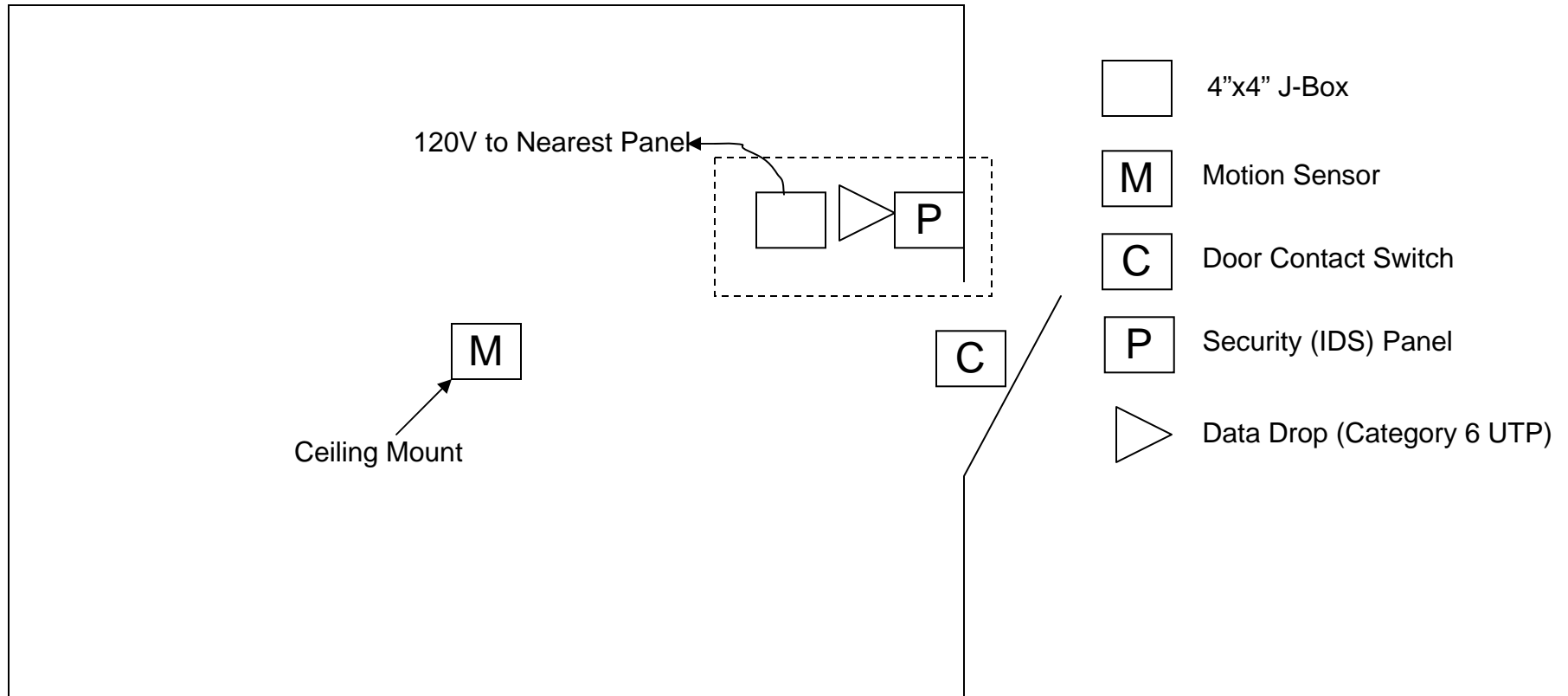
APPENDIX II

Intrusion Detection System Schematic

Typical Arms or Comsec Vault

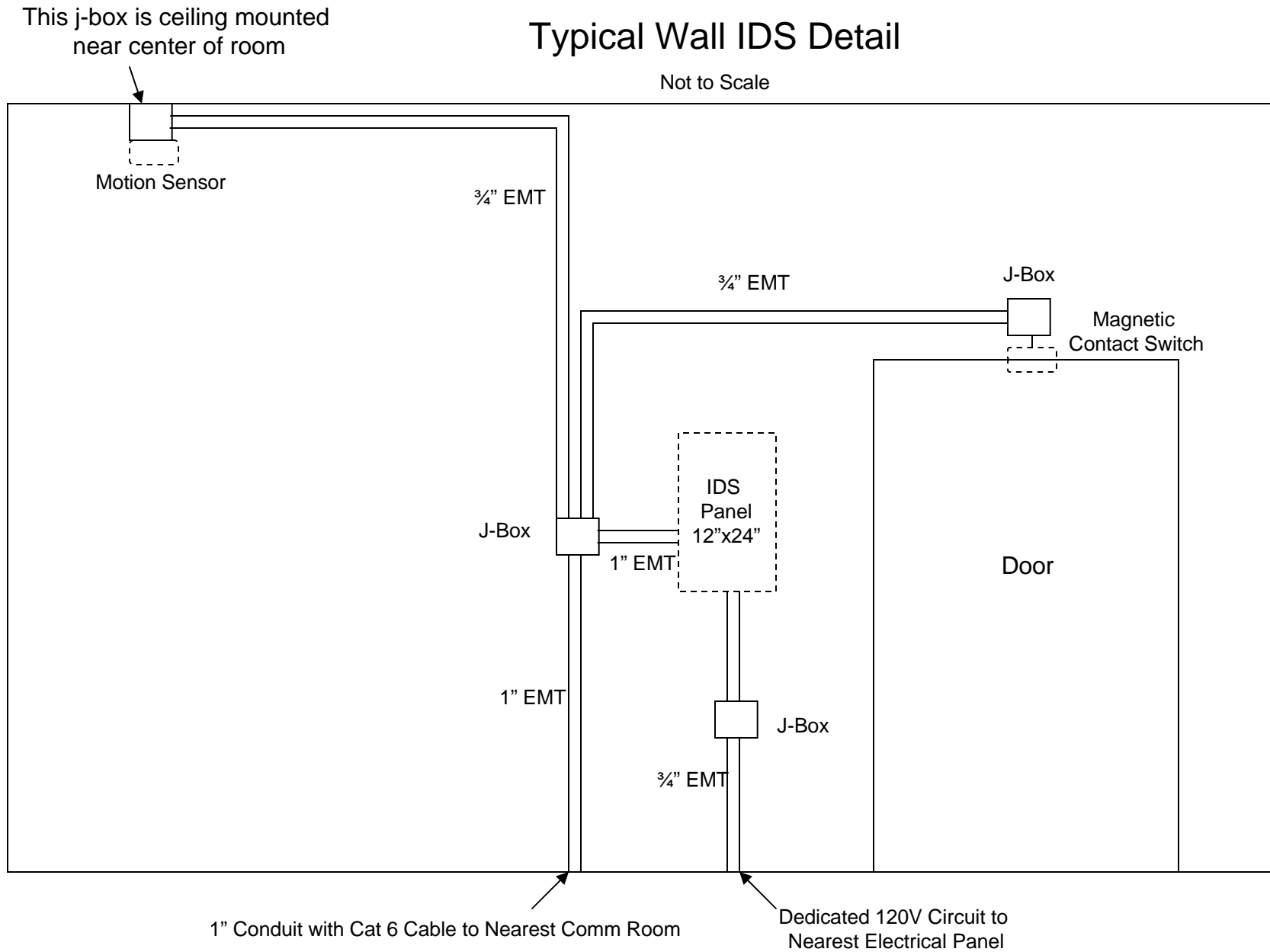
IDS Layout

Not to Scale



Typical Wall IDS Detail

Not to Scale



APPENDIX JJ

SITE SURVEY - SEE APPENDIX J

APPENDIX KK

SUPPLEMENTAL REQUIREMENTS

LENS, SUSTAINMENT AND THAAD PROJECT SPECIFIC REQUIREMENTS**FORT BLISS, TX**

This appendix contains supplemental requirements to Section 01 10 00 STATEMENT OF WORK, *AM5 Paragraphs 3 and* 6, that must be included in the project design and construction.

*AM5 The following paragraph supersedes paragraph 3.1.5 (3):

3.1.5 Architecture

(3) Natural Lighting. Repair and maintenance bays, storage and admin areas shall be illuminated using innovative solutions of hybrid lighting systems which includes electric lighting with electronic daylight controls in combination with daylighting. The daylighting should maintain the intent of the Area Development Guide and consist of translucent panels above overhead doors and skylights with reflective tube that channels the light into the work area and a lens that diffuses the light and/or combination of skylights and clerestory windows. Open maintenance and storage sheds shall use hybrid lighting systems with a dome-shape skylights. Provide operable windows for natural lighting and ventilation in administration and shop control, training room, break/training/conference room, and consolidated bench repair shop. Preference will be given for designs providing vision panels in overhead doors.*

APPROVED DEVIATIONS

Provide rough grading, infrastructure trunk mains (water, sewer, communications, gas and electric) and Organizational Vehicle Parking, etc. following a design developed by the Land Development Engineer (LDE) shown in Appendices MM. Coordinate work with LDE and COE Representative. Provide rough grading to entire site, including adjacent COF site, as shown in Appendix J.

Design will be in accordance with the POL Truck Company Area Development Guide in Appendix F. The use of the term "Guide" in titles such as "POL Truck Company Area Development Guide" and "Technical Guide for Information Infrastructure Architecture" does not imply that the requirements of these guides are optional. The requirements of all Guides and standards are mandatory; deviations must be approved by Fort Bliss and the Contracting Officer.

SITE PLANNING AND DESIGN

Plan, design, and construct all functional and technical site requirements listed in this project, including erosion control measures, underground conduit, piping, utility service lines and connections (electrical, communications, cable, water, sewer, stormwater, gas, mechanical), etc. within the project limits. The project limits are shown on the drawings. Base the site design upon conceptual site layouts in Appendix J. The D/B Contractor will be allotted an area as shown in the Access and Haul Route Plans in Appendix J for the placement of a construction trailer complex and storage for the D/B Contractor and all Sub-Contractors. Additional trailer space will not be allocated for Sub-contractors and therefore must be contained within the D/B Contractors' complex/building envelope. Permanent Trailers will not be permitted within the building envelope work areas. Trailers within the work area may be required to be relocated at no additional cost to the Government to accommodate other site activities. D/B Contractor shall be responsible for the site preparation, fencing, access drives, and maintenance of his complex at all times. D/B Contractor shall be responsible for the site preparation and access drives for the adjacent COF complex at all times. An access path shall be provided for emergency response vehicles and jobsite

access for the construction trailer complex, building envelope work area, and adjacent COF building envelope work area and shall be clear in the event of fire or medical emergency as per NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

Confine construction limits to the construction site boundaries for the specific facility location for the project. Construction limits shall be confined to the construction site boundaries as shown in Appendix J.

Demarcation: Verify and coordinate demarcation lines for design and demarcation lines for construction as shown in Appendix J, with the Government. The additional cost, if any, resulting from DB Contractor-requested deviations outside the design demarcation lines will be borne by the DB Contractor. Any such deviations must be reviewed and approved by the Government.

*AM5 The following paragraphs supersede paragraphs 6.3 and 6.4:

6.3 SITE PLANNING AND DESIGN

6.3.1. General. Coordinate site planning and design with the Land Development Engineer (LDE) and USACE for compliance with program intent. Perform site work in accordance with the THAAD Battery, Sustainment Brigade, and JLENS Infrastructure LDE DP 90, 91, and 92 Design Package drawings and specifications, hereinafter referred to as "Infrastructure Package," included in Appendix MM. Limits of construction are as shown in the Infrastructure Package.

6.3.1.1. The Contractor is responsible for any specific site preparation required to accommodate the proposed foundation design

6.3.1.2. Do not waste excess soil within the project site limits; deposit waste material as indicated in the Infrastructure Package.

6.3.1.3. The THAAD COF building, COF POV parking, landscaping, and COF utility installation past the points of demarcation will be installed by another contractor working under a separate contract. This work will be performed within the THAAD COF site limits as indicated in Appendix J. Prior to or on the date indicated in the Project Schedule in Appendix ZZ, complete and turn over to the Government all work within the THAAD COF site limits as indicated in Appendix J.

6.3.1.4. Coordination. Coordinate between the LDE, THAAD COF Contractor, and USACE regarding issues relating to site and facility design and functionality. Provide and maintain access to the area enclosed by the THAAD COF site limits at all times.

6.3.2. Site Structures and Amenities. Provide site structures and amenities as shown in the Infrastructure Package. See Appendices AA and GG for additional requirements for Site Structures and Amenities.

6.3.2.1. Construct all utilities as shown in the Infrastructure Package. Connect all utilities from the service connection points to the buildings.

6.3.3. Site Functional Requirements

6.3.3.1. Stormwater Management (SWM) System

(a) Storm Water Management: Provide construction storm water management for the overall project or area. Upon turnover of the THAAD COF site limits to the Government, the COF Contractor shall assume responsibility for the SWPPP for that area. Coordinate the laydown spaces, haul roads, and fabrication areas with the overall site SWPPP with the LDE, USACE, and the COF Contractor.

(b) Fort Bliss maintains a TCEQ Multi-Sector General Storm Water Permit (TXR050000) for industrial activities at the Post and a Phase II Small (MS4) General Permit (TXR040000) for operation of the Installation Urban MS4.

(c) Graded Slope and Fills: The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures generally not to exceed 3:1 slope. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion. The angle for graded slopes and fills must be demonstrated to be stable. Stable is the condition where the soil remains in its original configuration, with or without mechanical constraints.

(d) Ground Cover: Whenever land-disturbing activity is undertaken on a tract, the person conducting the land-disturbing activity shall install plant or otherwise provide a permanent ground cover per Fort Bliss seeding specification or Blue Grama, 11.25 Kg/ha of Pure Live Seed, unhulled, for erosion control.

(e) Final Inspection: When all construction on the project is complete, the Erosion and Sediment Control Inspector will evaluate the site and all permanent erosion control features, permanent ground cover and off-site impacts to other properties. If found to be in compliance, a close-out letter will be issued.

6.3.3.2. Erosion and Sediment Control

The Texas Pollutant Discharge Elimination System (TPDES) oversees the Stormwater Sediment and Erosion Control Management Plan for the Post. Comply with requirement general permit number TXR150000. Provide and maintain the SWPPP over the life of the project. Qualifying construction activities (greater than 1 acre) in the Texas portion of the Installation are conducted under the TCEQ Construction General Permit (TXR150000) or, in New Mexico, under the EPA Region VI Construction General Permit (FRL-8690-8; EPA-HQ-OW-2008-0238). Construction site operators on Fort Bliss meeting the definition in the permits of primary or secondary operator must comply with the appropriate State Construction General Permit. Depending on the execution mechanism of the project, the construction site operator may be all, or a combination of the Directorate of Public Works, US Army Corps of Engineers, the Land Development Engineer, Design Build contractor or other entities meeting the definition.

6.3.3.3. Vehicular Circulation. Not used.

6.4 SITE ENGINEERING

6.4.1. The existing site survey for the THAAD JLENS and Sustainment Brigade Development is included in the Infrastructure Package.

6.4.2. Existing Geotechnical Conditions: See Appendix A for a preliminary geotechnical report.

6.4.2.1. Borings, a boring location map, and the raw data on the subsurface conditions as described in Section 01 10 00, Section 5.2.2 are furnished as part of the RFP. Appendix A shows the boring locations overlaid on the rough grading plan. Geotechnical data and boring logs are provided for informational purposes only.

6.4.3. Fire Flow Tests. See Appendix D for the THAAD, JLENS, and Sustainment Brigade Fire Protection Automatic Sprinkler Fire Systems Study to use for basis of design for Fire Flow and Domestic Water Supply.

6.4.4. Pavement Engineering and Traffic Estimates

6.4.4.1. Not used

6.4.5. Traffic Signage

6.4.5.1. Not used.

6.4.6. Base Utility Information

6.4.6.1. Temporary Utilities: Existing and permanent utility systems are shown in the Infrastructure Package. Coordinate temporary utilities on site as needed. Truck water to the project site until new utilities are constructed. Temporary hydrants may be used as a water point source for construction. Until electrical utilities are constructed to the project site, provide generators and any required permits for each generator for on-site electrical service. Once utilities are constructed to the project site, arrange for and bear the cost of temporary electrical power and water service. Make requests for temporary electrical power and water service, including installation of construction meters, through DPW, not directly to the utility.

6.4.6.2. Permanent Utilities:

6.4.6.2.1 General: Construct all utilities as shown in the Infrastructure Package. Connect all utilities from the service connection points to the buildings.

- (a) Gas - Provide final gas load and desired service size to the LDE no later than 45 days prior to beginning building construction. I
- (b) Electricity – Provide final building electrical loads, voltage requirements, and desired service locations to the LDE no later than 45 days prior to beginning building construction.
- (c) Water –Provide required water service demand to LDE no later than 45 days prior to beginning building construction. Install a backflow preventer for the domestic water system in the Mechanical Room.
- (d) Fire Sprinkler Service – Verify the fire flow requirement of the new facility. Provide final building fire flow demand, to the LDE no later than 45 days prior to beginning building construction. Install a backflow preventer for the fire protection system in the sprinkler control room.
- (e) Sanitary Sewer – Provide final building sanitary sewer design flow to the LDE prior to finalizing design, but in any event, no later than 45 days prior to beginning building construction.

6.4.7. Cut and Fill

6.4.7.1. Not used.

6.4.8. Borrow Material

6.4.8.1. Not used.

6.4.9. Haul Routes and Staging Areas

6.4.9.1. A map with haul routes, construction entrance gate, staging areas, landfill, and borrow areas is included in the Infrastructure Package. Disposal areas are off site and are the Contractor's responsibility.

6.4.9.2. Install and maintain the haul road. Routing of haul roads will be coordinated with other Contractors performing concurrent construction so as not to interfere with their construction activities.

6.4.9.3. Construction Trailers: The Contractor has been allotted a lay down area of no more than 40,000 square feet in size as shown in the Infrastructure Package for the placement of a construction trailer complex and storage for the Contractor and all sub-contractors. Provide the site preparation, fencing, access drives, and ongoing maintenance of the lay down area. Additional trailer space will not be allocated for sub-contractors and, therefore, must be contained within the complex/building envelope. Permanent trailers are not permitted within the building envelope work areas. Trailers within the work area may be required to be relocated at no additional cost to the Government to accommodate other site activities. Provide an access path for emergency response vehicles at the construction job site and keep clear in the event of fire or medical emergency, per NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

6.4.10. Clearing and Grubbing: Site work will include clearing and grubbing as shown in the Infrastructure Package.

6.4.11. Landscaping

6.4.11.1. Not Used

6.4.12. Turf

6.4.12.1. Not used. *

Site Structures and Amenities

See Appendix AA, GG, J and MM for additional requirements for Site Structures and Amenities.

ARCHITECTURAL THEME

The architectural theme is identified in the POL Truck Company Area Design Guide. Site and Architectural conceptual drawings that meet this objective are shown in Appendix J, F and AA.

Additional Installation Architectural Requirements:

Standing Seam Metal Roof (SSMR) system with a non-reflective, factory applied color finish is the recommended roof system. Roof systems shall comply with UFC 3-600-01 for applicable fire rating. Roof systems shall be UL 90 rated or Factory Mutual Global (FM) I-90 rated.

Exterior Door Finish Hardware: Provide AR-1 keyways.

Exterior Windows: All operable windows must be lockable.

Interior Partitions and Walls:

a. Walls in areas with direct contact with automotive liquids, such as the Fluid Distribution Room shall be finished with gloss paint for ease of maintenance and cleaning.

b. Walls in areas with direct contact with water, such as Latrines and Break, Training and Conference Rooms, shall be finished with a semi-gloss paint for ease of maintenance and cleaning.

Interior Door Finish Hardware: Provide AR-1 keyways.

THAAD Only:

- a. Maintenance & Repair overhead doors shall be 15 ft H x 24 ft W (min.).
- b. Maintenance & Repair areas interior clear heights shall be 15 ft. min.

PLUMBING

Automatic infrared metered-flow faucets shall not be used.

SITE ELECTRICAL SYSTEMS

Exterior Communications: Install communications infrastructure as required by the drawings in Appendix J and MM. Cable TV is to be included in the site communications duct bank. Coordinate with Ft Bliss DOIM/NEC Plans Office. Underground conduit and copper voice/data cables extending to any building shall be routed to a specific manhole or hand hole. The buildings shall not be daisy chained together.

FACILITY ELECTRICAL SYSTEMS

THAAD Only:

*AM2 a. Deleted. *

b. Provide one 3-phase, 480V receptacle and one 3-phase, 208V receptacle for radar in one of the repair bay areas as directed by the Government.

Landscaping and irrigation controls – Not Required for TEMFS.

Provide weather-tight through-roof conduit from Comm. Room to roof for installation of communication cable and Government installed roof mounted antenna. Provide accommodations for user-provided VSAT antenna exterior to the TEMF. VSAT antenna shall be adjacent to an interior space capable of supporting the associated user-provided modem case (approximately the size of a medium suitcase). Provide a 3-inch sealable penetration through the exterior wall to allow a cable connection between the VSAT antenna and modem. Provide two (2), 1-inch diameter rigid conduit runs with eight (8), Cat 6 cables (4 per conduit) from the modem case location to above the lay-in ceiling in the Administration and Shop Control space. The eight Cat 6 cables shall be provided with adequate length above the lay-in ceiling to reach any cubical in the Administration and Shop Control space. The D/B Contractor shall also provide design and construction of a steel stand to support the VSAT antenna including appropriate grounding for the antenna, mounting hardware and stand. Provide two (2) bollards of the same size and type identified in the TEMF Standard Design, UFC 4-214-02 to protect the VSAT antenna. Antenna must have a clear line-of-sight to the southwest.

In stairwells with exterior windows, any lighting that is not on an emergency circuit shall be controlled by a switch and photocell.

Arms Rooms / Vaults: A tamper-proof light fixture on a separate switch is to be provided outside the entrance to each Arms Room / Vault. Switch is to be positioned so that unauthorized personnel may not have access.

There shall be a minimum of one telephone outlet/jack for wall mount telephone connected to the telecommunications room with Category 6 cable in all common areas, mechanical rooms, communication rooms, and electrical rooms.

HEATING, VENTILATING AND AIR CONDITIONING

Evaporative cooling not used for TEMF.

Repair, Maintenance and Circulation Bays: Exhaust makeup and ventilation air for all the bays shall be provided by makeup air handling units. Makeup air may be minimally tempered by natural gas although it is not mandatory as other heating media may be used. Continuous mechanical ventilation of the bays to provide makeup air (for all vehicle exhausts, etc.) and people ventilation shall be provided. It is preferred that all mechanical equipment is installed inside the facility. In general, coordination of overhead space with cranes, heating equipment, lighting, etc. is very important.

*AM3 MECHANICAL

Vehicle Exhaust Evacuation Systems: Two Repair Bays within the THAAD 35-ton crane TEMF shall provide for the higher temperature and flow rates indicated in Section 01 10 00, paragraph 3.1.7 (4). No higher temperature and flow rates are required at the JLENS or Sustainment TEMFs. *

*AM6 The following paragraph supersedes paragraph 6.11.6:

6.11.6 Integration of Buildings and Facilities Into the Existing Fort Bliss Post-wide Energy and Utility Monitoring and Control Systems (EMCS, aka UMCS).

1. The existing post-wide UMCS is an Open Lonworks system; specifically, the system is a Johnson Controls Metasys Utility Monitoring and Control System.

2. All Building and Facility Controls Systems shall be fully integrated into the existing post-wide UMCS. This will include fully testing, commissioning and Government acceptance in all cases.

3. All utility meters shall be connected to the postwide UMCS to enable metering and all other available data to be centrally tracked, monitored and utilized. All meter data shall be mapped and integrated to be fully available at the UMCS; for electric "smart" meters, the number of data points and types of data are significant.

4. All points available to the UMCS from building controls and metering shall be fully trendable.

5. To hookup and integrate the building or facility, the Contractor shall provide all conduit (for instance, from DDC control panel to comm. room for connection and from DDC panel(s) to meters), wiring and comm. cabling to all connected points and devices, power, backup power (as necessary), communications devices (routers, etc.), programming, labor, installation hardware, testing, commissioning, etc. to ensure full integration and complete Government acceptance.

6. The UMCS shall provide supervisory and as desired by the post direct control for energy savings and all normal and available energy savings software routines shall be instrumented and fully implemented in the UMCS integration and local controls. Energy saving controls by UMCS shall include but not be limited to, Scheduled and Optimal Start/Stop, Duty Cycling, Economization, Selection of plant equipment for best efficiency, Trending, Reset of Supply Air and Water Temperatures based upon Loads and space conditions, Reset of space control temperatures. UMCS shall be able to see and control all zone/space temperatures and humidities, where applicable and monitor, log, etc. all building and equipment alarms. UMCS shall be able to control (start/stop, enable) all HVAC equipment. Additionally, UMCS shall be able to do demand limiting control.

7. Specific Requirements:

a. Provide a 3/4" conduit with CAT 6 cable from the UMCS router to the Communication Room for connection to the building LAN.

b. Main DDC building controls panels, all UMCS, equipment, etc. shall be installed in facility/building mechanical room. Any DDC controls sub-panels shall be installed next to or near the equipment controlled, unless there is an environment problem.

c. DDC panels and all UMCS and control equipment shall be designed or equipped to handle temperature or humidity conditions in the installed locations for long life.

APPENDIX MM

INFRASTRUCTURE PACKAGE

*AM1 PACKAGE IS ON THE FOLLOWING FTP SITE:

ftp://155.88.25.15/W912HN-07-X-1012_DS01/

Access instructions:

1. Use a Windows explorer window in lieu of an internet explorer window to access.
2. Use lower case letters for both the USER NAME & PASSWORD.
3. USER NAME & PASSWORD = transfer

*

APPENDIX NN

VEHICLE LISTS

JLENS VEHICLES**Category Code: 85210 Parking Area, Organizational Vehicles****Criteria**

The total pavement allowance under this category code is dependent on the type and size of facilities included in the maintenance complex; the parking area allowance is based on the quantity and size of organizational vehicles authorized (normally at strength level 1), to include the circulation aisle(s). The parking configuration utilized for calculation of the area needed is as follows:

1. Parking stalls are placed back-to-back with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles more than 18 feet long.
2. All circulation lane widths are 30 feet.
3. Trailers other than semitrailers are usually parked with their prime movers.
4. Side clearances for parking of vehicles are 3 linear feet. End clearances are 2 linear feet.
5. Unit integrity of parked vehicles is maintained where possible. However, partially filled parking rows will be filled by vehicles from the next organization.
6. POL vehicles are parked in a physically separated area in rows 50 feet apart, with a 10-foot clearance between vehicles.
7. Not used.
8. For category code 21410 Tactical Equipment Maintenance Facility (TEMF): The total area provided for these facilities includes facility aprons measuring 45 feet on all four sides of the facility. Additionally, a 20 foot wide circulation lane is provided on all four sides of the facility.
9. For category code 21470 - Oil Storage Building: The pavement associated with this building consists of apron only, as it is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. By using an assumed building length of 20 feet, and a fixed apron depth of 27 feet, each facility is assigned 84 square yards. Because this allowance is generally quite small, it is ignored in the computation below.
10. For category code 44224 - Organizational Storage Building: The pavement associated with this building consists of apron only, since the building is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. The computation used in the FPS assumes a building width of 25 feet, and a fixed apron depth of 27 feet.
11. For category code 44262 - Vehicle Storage Sheds: See the Basis of Calculation section below.

References:

Army Criteria Tracking System (ACTS)	28 Dec 2006
TI 800-01, Chapter 4	18 Mar 2002
DA PAM 415-28, Guide to Army Real Property Category Codes	11 Apr 2006
UFC 4-214-02, Tactical Equipment Maintenance Facility (TEMF) Standard Design	5 Oct 2007

Basis of Calculation:

The paved areas included under this category code consist of vehicle parking areas as well as the aprons and circulation lanes associated with each of the facilities located in a maintenance complex. The total pavement allowance is based on the type and size of the vehicles and facilities.

The parking allowances are based on the number and size of organizational vehicles authorized (usually at strength level 1). The initial step is to identify and separate these vehicles according to their parking needs. The calculation of hardstand pavement allowances is based on back-to-back parking stalls with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles greater than 18 feet long. (For POL vehicles, see POL Vehicle Parking below.)

The Trigger/Counter (T/C) codes are as follows:

- A - Trucks, 5/4 ton of less
- B - Trucks, 2-1/2 ton
- C - Trucks, 5 ton
- D - Trucks, 8-ton and greater
- E - Trucks, Tractor

JLENS VEHICLES

F - Trucks, 2-1/2 ton, can haul TPUs
G - Trucks, 5-ton, can haul TPU's
J - Trailers towed by Truck Class A
K - Trailers towed by Truck Class B
L - Trailers towed by Truck Class C
M - Trailers towed by Truck Class D
N - Semitrailers
P - POL Tank Trucks
Q - TPUs and Trailer-mounted Fuel Tanks
S - POL Semitrailers
T - Tracked Vehicles
V - Class IX Supply Trailers (to be parked adjacent to warehouse)
W - Trailers towed by Truck Class A, can haul TPU's
X - Vehicles/Equipment which do not pull trailers
Y - Trailers towed by Truck Class B, can haul TPUs
Z - Trailers towed by Truck Class C, can haul TPU's

The vehicles and trailers with their length and width dimensions are identified by equipment Line Item Number (LIN). The POL (Petroleum, Oil and Lubricant) vehicles, including Tank and Pump Units (TPUs), and trailer-mounted tank units, are separated, and five-ton trucks and 1-1/2-ton trailers are allocated to transport the TPUs and the trailer mounted tank units. Class IX vehicles are also identified and separated, as they will be parked on the apron areas adjoining the warehouse and DS maintenance shop, and are not allowed additional hardstand. Other vehicles separated are the combat vehicles designated for parking in the vehicle storage sheds (category code 44262), which are authorized for Europe and Korea only. Subsequent to the identification of all vehicles, the trailers are matched with trucks by company, based on weight classifications.

The space allowance for parking the vehicles is based on a standardized layout conforming to the above criteria. Constant site width for each of the unique conditions was established based on a standard layout for the site structures. The parking stalls are then plotted mathematically, starting with the longest vehicle or vehicle/trailer combination in the first organization in the user's list, continuing through each organization, and going alternately from shortest to longest and longest to shortest vehicles.

The longest vehicle or vehicle combination in each row establishes the row width and the width of the access lane. Circulation lanes 30 feet wide extend along both sides of the hardstand.

POL Vehicle Parking

The POL vehicle parking area is presumed to be physically separated from the regular vehicle hardstand and is calculated separately. POL Semitrailers with tractor are allowed a 19-foot by 55-foot space with a 50-foot access lane. Other POL vehicles are assigned a 19-foot by 40-foot space with a 50-foot access lane. The computer program matches tractors and semitrailers to other POL Truck-trailer combinations prior to calculating space allowances.

Summary

The number of tactical vehicles and major equipment items in the planning base for organizational parking (category code 85210) plus the number of combat vehicles, radars, and major weapons systems in the planning base for vehicle storage sheds (category code 44262) equals the total number of major pieces of equipment for which space is provided in the maintenance complex. This is not equal to the total number of parking spaces, due to factors such as vehicle storage sheds in Europe and Korea, the pairing of trucks and trailers in single parking spaces based on pavement usage optimization, the diversion of Class IX storage vans to the area around the maintenance shop where they are more easily accessed by maintenance personnel, the mounting of TPU's on trucks or trailers, etc.

JLENS VEHICLES**Planning Base: Type, Size, and Number of Organizational Vehicles****Equipment Triggers and Counters:****44427G000 6 AMD BATTERY (JLENS)**

<u>LIN</u>	<u>LIN Description</u>	<u>Para</u>	<u>Length (Inches)</u>	<u>Width (Inches)</u>	<u>T/C Code</u>	<u>Quantity</u>
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	01	45	24	X	2
G36237	GENERATOR SET DIESEL: 60HZ AC	01	30	23	X	1
L28351	KITCHEN FIELD TRAILER MOUNTED: MTD ON M103A3 TRAILER	01	171	92	K	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	01	255	96	F	1
T61908	TRUCK CARGO: MTV W/E	01	278	96	G	1
T93761	TRAILER: PALLETIZED LOADING 8X20	01	306	96	M	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	01	401	96	D	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	01	210	96	K	1
W95537	TRAILER CARGO: 3/4 TON 2 WHEEL W/E	01	147	74	W	2
Z00206	MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM: MTRCS TRK UTILITY COMMAND AND CONTROL IAP/ARMOR READY HMMWV:	01	96*	240*	X	1
Z00958	XM1165A1	01	194*	110*	A	2
Z01013	TRUCK UTILITY: ECV SHELTER/TROOP/CARGO M1152A1	01	194*	110*	A	2
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E	01	243*	98*	L	1
Z01013	TRUCK UTILITY: ECV SHELTER/TROOP/CARGO M1152A1	02	194*	110*	A	4
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	03	45	24	X	1
G74711	GEN SET: DED SKID MTD 10KW 60HZ TRUCK TANK: FUEL SERVICING 2500 GALLON 8X8 HEAVY EXP MOB	03	62	32	X	1
T58161	W/WINCH	03	401	96	P	4
T60081	TRUCK CARGO: 4X4 LMTV W/E TRUCK WRECKER: TACTICAL 8X8 HEAVY EXPANDED MOBILITY	03	255	96	F	5
T63093	W/WINCH	03	402	102	D	1
T93484	TRUCK VAN: LMTV W/E	03	264	96	F	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	03	210	96	K	1
W95537	TRAILER CARGO: 3/4 TON 2 WHEEL W/E	03	147	74	W	1
Z01013	TRUCK UTILITY: ECV SHELTER/TROOP/CARGO M1152A1	03	194*	110*	A	4
C84930	CONTAINER HANDLING: HEAVY EXP MOBIL TACT TRK (HEMTT)	04	421*	96*	X	10
F43429	CRANE TRUCK MOUNTED: HYD 25 TON CAT (CCE) SEMITRAILER LOW BED: 70 TN HEAVY EQUIPMENT TRANSPORTER	04	458	118	X	2
S70859	(HET)	04	622	144	N	8
T48941	TRUCK LIFT FORK: DED 50000 LB CONT HDLR ROUGH TERRAIN 48 IN LC	04	412	240	X	2
T59048	TRUCK TRACTOR: HEAVY EQUIPMENT TRANSPORTER (HET)	04	363	111	E	8
T73347	TRUCK LIFT: FORK VARIABLE REACH ROUGH TERRAIN	04	317	101	X	2
T93761	TRAILER: PALLETIZED LOADING 8X20	04	306	96	M	8
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	04	401	96	D	10
T95992	LIGHT TACTICAL TRAILER: 3/4 TON TRK UTILITY COMMAND AND CONTROL IAP/ARMOR READY HMMWV:	05	132	86	J	1
Z00958	XM1165A1	05	194*	110*	A	1
C84930	CONTAINER HANDLING: HEAVY EXP MOBIL TACT TRK (HEMTT)	06	421*	96*	X	1
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	06	45	24	X	2
T93761	TRAILER: PALLETIZED LOADING 8X20	06	306	96	M	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	06	401	96	D	1
W95537	TRAILER CARGO: 3/4 TON 2 WHEEL W/E	06	147	74	W	2
Z01013	TRUCK UTILITY: ECV SHELTER/TROOP/CARGO M1152A1	06	194*	110*	A	3
C36586	CRANE: WHEEL MOUNTED HYDRAULIC 25 TON ALL TERRAIN AT422T	07	395	101	X	1
C39398	CRANE WHEEL MOUNTED: HYD ROUGH TERRAIN (RTCC)	07	556	144	X	1
C84930	CONTAINER HANDLING: HEAVY EXP MOBIL TACT TRK (HEMTT) EXCAVATOR: HYDRAULIC (HYEX) TYPE III MULTIPURPOSE CRAWLER	07	421*	96*	X	16
E27860	MOUNT	07	436	126	X	4
F39378	CRANE WHEEL MTD: 20 TON W/BOOM CRANE 30 FT W/BLK TKLE 20 TON CRANE-SHOVEL TRK MTD: 20T W/BOOM CRANE 30 FT W/BLK TKLE 30	07	537	150	X	1
F43414	FT	07	522	105	X	1
F43429	CRANE TRUCK MOUNTED: HYD 25 TON CAT (CCE)	07	458	118	X	1
R16611	ROUGH TERRAIN CONTAINER HANDLER (RTCH): KALMAR RT240	07	561	144	X	1
S06648	SURVEILLANCE INFORMATION PROCESSING CENTER: OL-640/TSQ- 105(V)6	07	525	103	N	3
S06716	SURVEILLANCE INFORMATION PROCESSING CENTER: OL-638/TSQ- 105(V)6	07	525	103	N	3
T40565	SHOVEL FRONT CRANE-SHOVEL: CRLR MTD 3/4 CUYD 12-1/2 TON	07	300	41	T	1
T48941	TRUCK LIFT FORK: DED 50000 LB CONT HDLR ROUGH TERRAIN 48 IN LC	07	412	240	X	1
T73347	TRUCK LIFT: FORK VARIABLE REACH ROUGH TERRAIN TRUCK TRACTOR: TACTICAL 8X8 HEAVY EXPANDED MOBILITY	07	317	101	X	1
T88677	W/WINCH	07	351	99	E	5
T91656	TRUCK TRACTOR: LET 6X6 66000 GVW W/W C/S	07	295	121	E	3
T93761	TRAILER: PALLETIZED LOADING 8X20	07	306	96	M	14
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	07	401	96	D	16

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W95811	TRAILER CARGO: 1-1/2 TON 2 WHEEL W/E	07	182	98	W	1
X40794	TRUCK CARGO: DROP SIDE 5 TON 6X6 W/E	07	311	99	G	1
X49051	TRUCK LIFT FORK: DSL DRVN 10000 LB CAP ROUGH TERRAIN	07	214	133	X	1
Z98930	SELF-LOAD/OFF-LOAD TRAILER: (MEDIUM)	07	368*	96*	L	3
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	08	132	86	J	1
	TRK UTILITY COMMAND AND CONTROL IAP/ARMOR READY HMMWV: XM1165A1	08	194*	110*	A	1
Z00958						
C84930	CONTAINER HANDLING: HEAVY EXP MOBIL TACT TRK (HEMTT)	09	421*	96*	X	1
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	09	45	24	X	2
T93761	TRAILER: PALLETIZED LOADING 8X20	09	306	96	M	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	09	401	96	D	1
W95537	TRAILER CARGO: 3/4 TON 2 WHEEL W/E	09	147	74	W	2
Z01013	TRUCK UTILITY: ECV SHELTER/TROOP/CARGO M1152A1	09	194*	110*	A	3
C36586	CRANE: WHEEL MOUNTED HYDRAULIC 25 TON ALL TERRAIN AT422T	10	395	101	X	1
C39398	CRANE WHEEL MOUNTED: HYD ROUGH TERRAIN (RTCC)	10	556	144	X	1
C84930	CONTAINER HANDLING: HEAVY EXP MOBIL TACT TRK (HEMTT)	10	421*	96*	X	16
	EXCAVATOR: HYDRAULIC (HYEX) TYPE III MULTIPURPOSE CRAWLER MOUNT	10	436	126	X	5
E27860						
F39378	CRANE WHEEL MTD: 20 TON W/BOOM CRANE 30 FT W/BLK TKLE 20 TON	10	537	150	X	1
	CRANE-SHOVEL TRK MTD: 20T W/BOOM CRANE 30 FT W/BLK TKLE 30 FT	10	522	105	X	1
F43414						
F43429	CRANE TRUCK MOUNTED: HYD 25 TON CAT (CCE)	10	458	118	X	1
R16611	ROUGH TERRAIN CONTAINER HANDLER (RTCH): KALMAR RT240	10	561	144	X	1
	SURVEILLANCE INFORMATION PROCESSING CENTER: OL-640/TSQ-105(V)6	10	525	103	N	3
S06648						
	SURVEILLANCE INFORMATION PROCESSING CENTER: OL-638/TSQ-105(V)6	10	525	103	N	3
S06716						
T40565	SHOVEL FRONT CRANE-SHOVEL: CRLR MTD 3/4 CUYD 12-1/2 TON	10	300	41	T	1
T48941	TRUCK LIFT FORK: DED 50000 LB CONT HDLR ROUGH TERRAIN 48 IN LC	10	412	240	X	1
T73347	TRUCK LIFT: FORK VARIABLE REACH ROUGH TERRAIN	10	317	101	X	1
	TRUCK TRACTOR: TACTICAL 8X8 HEAVY EXPANDED MOBILITY W/WINCH	10	351	99	E	5
T88677						
T91656	TRUCK TRACTOR: LET 6X6 66000 GVW W/W C/S	10	295	121	E	3
T93761	TRAILER: PALLETIZED LOADING 8X20	10	306	96	M	14
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	10	401	96	D	16
W95811	TRAILER CARGO: 1-1/2 TON 2 WHEEL W/E	10	182	98	W	1
X40794	TRUCK CARGO: DROP SIDE 5 TON 6X6 W/E	10	311	99	G	1
X49051	TRUCK LIFT FORK: DSL DRVN 10000 LB CAP ROUGH TERRAIN	10	214	133	X	1
Z98930	SELF-LOAD/OFF-LOAD TRAILER: (MEDIUM)	10	368*	96*	L	3

Total Vehicles**273**

* Estimated value

SUSTAINMENT VEHICLES

Category Code: 85210 Parking Area, Organizational Vehicles

Criteria

The total pavement allowance under this category code is dependent on the type and size of facilities included in the maintenance complex; the parking area allowance is based on the quantity and size of organizational vehicles authorized (normally at strength level 1), to include the circulation aisle(s). The parking configuration utilized for calculation of the area needed is as follows:

1. Parking stalls are placed back-to-back with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles more than 18 feet long.
2. All circulation lane widths are 30 feet.
3. Trailers other than semitrailers are usually parked with their prime movers.
4. Side clearances for parking of vehicles are 3 linear feet. End clearances are 2 linear feet.
5. Unit integrity of parked vehicles is maintained where possible. However, partially filled parking rows will be filled by vehicles from the next organization.
6. POL vehicles are parked in a physically separated area in rows 50 feet apart, with a 10-foot clearance between vehicles.
7. Not used.
8. For category code 21410 Tactical Equipment Maintenance Facility (TEMF): The total area provided for these facilities includes facility aprons measuring 45 feet on all four sides of the facility. Additionally, a 20 foot wide circulation lane is provided on all four sides of the facility.
9. For category code 21470 - Oil Storage Building: The pavement associated with this building consists of apron only, as it is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. By using an assumed building length of 20 feet, and a fixed apron depth of 27 feet, each facility is assigned 84 square yards. Because this allowance is generally quite small, it is ignored in the computation below.
10. For category code 44224 - Organizational Storage Building: The pavement associated with this building consists of apron only, since the building is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. The computation used in the FPS assumes a building width of 25 feet, and a fixed apron depth of 27 feet.
11. For category code 44262 - Vehicle Storage Sheds: See the Basis of Calculation section below.

References:

Army Criteria Tracking System (ACTS)	28 Dec 2006
TI 800-01, Chapter 4	18 Mar 2002
DA PAM 415-28, Guide to Army Real Property Category Codes	11 Apr 2006
UFC 4-214-02, Tactical Equipment Maintenance Facility (TEMF) Standard Design	5 Oct 2007

Basis of Calculation:

The paved areas included under this category code consist of vehicle parking areas as well as the aprons and circulation lanes associated with each of the facilities located in a maintenance complex. The total pavement allowance is based on the type and size of the vehicles and facilities.

The parking allowances are based on the number and size of organizational vehicles authorized (usually at strength level 1). The initial step is to identify and separate these vehicles according to their parking needs. The calculation of hardstand pavement allowances is based on back-to-back parking stalls with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles greater than 18 feet long. (For POL vehicles, see POL Vehicle Parking below.)

The Trigger/Counter (T/C) codes are as follows:

- A - Trucks, 5/4 ton or less
- B - Trucks, 2-1/2 ton
- C - Trucks, 5 ton
- D - Trucks, 8-ton and greater
- E - Trucks, Tractor

SUSTAINMENT VEHICLES

F - Trucks, 2-1/2 ton, can haul TPUs
G - Trucks, 5-ton, can haul TPU's
J - Trailers towed by Truck Class A
K - Trailers towed by Truck Class B
L - Trailers towed by Truck Class C
M - Trailers towed by Truck Class D
N - Semitrailers
P - POL Tank Trucks
Q - TPUs and Trailer-mounted Fuel Tanks
S - POL Semitrailers
T - Tracked Vehicles
V - Class IX Supply Trailers (to be parked adjacent to warehouse)
W - Trailers towed by Truck Class A, can haul TPU's
X - Vehicles/Equipment which do not pull trailers
Y - Trailers towed by Truck Class B, can haul TPUs
Z - Trailers towed by Truck Class C, can haul TPU's

The vehicles and trailers with their length and width dimensions are identified by equipment Line Item Number (LIN). The POL (Petroleum, Oil and Lubricant) vehicles, including Tank and Pump Units (TPUs), and trailer-mounted tank units, are separated, and five-ton trucks and 1-1/2-ton trailers are allocated to transport the TPUs and the trailer mounted tank units. Class IX vehicles are also identified and separated, as they will be parked on the apron areas adjoining the warehouse and DS maintenance shop, and are not allowed additional hardstand. Other vehicles separated are the combat vehicles designated for parking in the vehicle storage sheds (category code 44262), which are authorized for Europe and Korea only. Subsequent to the identification of all vehicles, the trailers are matched with trucks by company, based on weight classifications.

The space allowance for parking the vehicles is based on a standardized layout conforming to the above criteria. Constant site width for each of the unique conditions was established based on a standard layout for the site structures. The parking stalls are then plotted mathematically, starting with the longest vehicle or vehicle/trailer combination in the first organization in the user's list, continuing through each organization, and going alternately from shortest to longest and longest to shortest vehicles.

The longest vehicle or vehicle combination in each row establishes the row width and the width of the access lane. Circulation lanes 30 feet wide extend along both sides of the hardstand.

POL Vehicle Parking

The POL vehicle parking area is presumed to be physically separated from the regular vehicle hardstand and is calculated separately. POL Semitrailers with tractor are allowed a 19-foot by 55-foot space with a 50-foot access lane. Other POL vehicles are assigned a 19-foot by 40-foot space with a 50-foot access lane. The computer program matches tractors and semitrailers to other POL Truck-trailer combinations prior to calculating space allowances.

Summary

The number of tactical vehicles and major equipment items in the planning base for organizational parking (category code 85210) plus the number of combat vehicles, radars, and major weapons systems in the planning base for vehicle storage sheds (category code 44262) equals the total number of major pieces of equipment for which space is provided in the maintenance complex. This is not equal to the total number of parking spaces, due to factors such as vehicle storage sheds in Europe and Korea, the pairing of trucks and trailers in single parking spaces based on pavement usage optimization, the diversion of Class IX storage vans to the area around the maintenance shop where they are more easily accessed by maintenance personnel, the mounting of TPU's on trucks or trailers, etc.

SUSTAINMENT VEHICLES**Planning Base: Type, Size, and Number of Organizational Vehicles****Equipment Triggers and Counters:****63402G2A0 6 HHC, SUSTAINMENT BRIGADE**

<u>LIN</u>	<u>LIN Description</u>	<u>Para</u>	<u>Length (Inches)</u>	<u>Width (Inches)</u>	<u>T/C Code</u>	<u>Quantity</u>
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	01	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	02	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	02	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	03	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	03	132	86	J	1
G53778	GENERATOR SET DIESEL ENGINE TM: PU-802	04	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	04	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	04	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	04	337	96	C	1
G42170	GEN SET DED TM: 10KW 60HZ MTD ONM116A2 PU-798	05	147	84	K	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	05	255	96	F	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	05	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	05	132	86	J	2
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	05	210	96	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	06	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	06	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	07	180	86	A	1
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	07	197	86	A	1
T95924	TRAILER CARGO: HIGH MOBILITY 1-1/4 TON	07	132	86	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	07	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	08	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	09	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	10	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	11	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	11	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	12	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	12	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	13	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	13	132	86	J	1
T38844	TRUCK AMBULANCE: 4 LITTER ARMD 4X4 W/E (HMMWV)	14	205	102	A	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	15	180	86	A	1
G42170	GEN SET DED TM: 10KW 60HZ MTD ONM116A2 PU-798	16	147	84	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	16	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	16	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	16	337	96	C	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	17	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	17	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	18	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	18	132	86	J	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	19	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	19	132	86	J	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	20	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	20	132	86	J	2
G53778	GENERATOR SET DIESEL ENGINE TM: PU-802	21	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	21	180	86	A	1
T61908	TRUCK CARGO: MTV W/E	21	278	96	G	1
T95555	TRAILER CARGO: MTV W/DROPSIDES M1095	21	232	96	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	21	132	86	J	1
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	21	337	96	C	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	22	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	22	132	86	J	2
G53778	GENERATOR SET DIESEL ENGINE TM: PU-802	23	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	23	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	23	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	23	337	96	C	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	24	180	86	A	5
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	24	132	86	J	4
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	25	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	25	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	26	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	26	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	27	180	86	A	2
G78306	GENERATOR SET: DIESEL TRL/MTD 60KW 50/60HZ PU805 CHASSIS W/FENDE	28	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	28	180	86	A	2

SUSTAINMENT VEHICLES

T95992	LIGHT TACTICAL TRAILER: 3/4 TON	28	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	28	337	96	C	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	29	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	29	132	86	J	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	30	255	96	F	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	30	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	30	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	30	337	96	C	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	31	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	31	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	32	180	86	A	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	33	180	86	A	1
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	33	197	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	33	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	34	180	86	A	1
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	34	197	86	A	1
T95924	TRAILER CARGO: HIGH MOBILITY 1-1/4 TON	34	132	86	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	34	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	35	180	86	A	1
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	35	197	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	35	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	36	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	37	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	37	132	86	J	1
P42194	POWER PLANT: ELECTRIC TRL/MTD 60KW 50/60HZ AN/MJQ 41	38	165	95	L	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	38	255	96	F	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	38	180	86	A	1
T61908	TRUCK CARGO: MTV W/E	38	278	96	G	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	38	210	96	K	1
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E	38	243 *	98 *	L	1
C27633	CONTAINERIZED KITCHEN: CK	39	240	96	X	1
G74711	GEN SET: DED SKID MTD 10KW 60HZ	39	62	32	X	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	39	180	86	A	1
T61908	TRUCK CARGO: MTV W/E	39	278	96	G	2
T93761	TRAILER: PALLETIZED LOADING 8X20	39	306	96	M	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	39	132	86	J	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	39	401	96	D	1
Z00206	MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM: MTRCS	39	96 *	240 *	X	2
Z00375	ASSAULT KITCHEN: (AK)	39	171	92	K	1
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E	39	243 *	98 *	L	1
C32887	CLEANER STEAM PRESSURE JET TRAILER MOUNTED:	40	146	72	J	1
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	40	45	24	X	2
G74711	GEN SET: DED SKID MTD 10KW 60HZ	40	62	32	X	1
H00654	HEATER: DUCT TYPE PORTABLE 350K BTU	40	65 *	72 *	J	1
P96640	PUMPING ASSEMBLY FLAMMABLE LIQUID BULK TRANSFER:	40	50	51	Q	1
T41135	TRUCK CARGO: MTV W/E W/W	40	279	96	G	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	40	180	86	A	1
T61908	TRUCK CARGO: MTV W/E	40	278	96	G	1
T94709	TRUCK WRECKER: MTV W/E W/W	40	360	96	C	1
T95555	TRAILER CARGO: MTV W/DROPSIDES M1095	40	232	96	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	40	132	86	J	1
V12141	TANK AND PUMP UNIT LIQUID DISPENSING TRUCKMOUNTING:	40	320 *	115 *	Q	1
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING:	40	66	75	Q	1

63402G2B0 2 EARLY ENTRY ELEMENT

<u>LIN</u>	<u>LIN Description</u>	<u>Para</u>	<u>Length (Inches)</u>	<u>Width (Inches)</u>	<u>T/C Code</u>	<u>Quantity</u>
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	01	180	86	A	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	02	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	02	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	03	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	03	132	86	J	1
G53778	GENERATOR SET DIESEL ENGINE TM: PU-802	04	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	04	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	04	132	86	J	1
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	04	337	96	C	1
G53778	GENERATOR SET DIESEL ENGINE TM: PU-802	05	165	95	L	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	05	255	96	F	2
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	05	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	05	132	86	J	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	05	210	96	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	06	180	86	A	1

SUSTAINMENT VEHICLES

T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	06	197	86	A	1
T95924	TRAILER CARGO: HIGH MOBILITY 1-1/4 TON	06	132	86	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	06	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	08	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	08	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	09	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	09	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	12	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	12	132	86	J	1
G35851	GENERATOR SET DIESEL ENGINE TM: PU-803	13	165	95	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	13	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	13	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	13	337	96	C	1
G35851	GENERATOR SET DIESEL ENGINE TM: PU-803	14	165	95	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	14	180	86	A	2
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	14	132	86	J	2
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	14	337	96	C	1
	GENERATOR SET: DIESEL TRL/MTD 60KW 50/60HZ PU805 CHASSIS					
G78306	W/FENDE	15	165	95	L	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	15	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	15	132	86	J	1
Z94560	TRUCK VAN: EXPANSIBLE MTV W/E	15	337	96	C	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	16	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	16	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	17	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	18	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	18	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	19	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	19	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	21	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	21	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	23	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	24	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	24	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	25	180	86	A	1
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	26	197	86	A	1
T61908	TRUCK CARGO: MTV W/E	27	278	96	G	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	27	210	96	K	1
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E	27	243 *	98 *	L	1
G36237	GENERATOR SET DIESEL: 60HZ AC	28	30	23	X	1
L28351	KITCHEN FIELD TRAILER MOUNTED: MTD ON M103A3 TRAILER	28	171	92	K	1
T61908	TRUCK CARGO: MTV W/E	28	278	96	G	1
T93761	TRAILER: PALLETIZED LOADING 8X20	28	306	96	M	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	28	401	96	D	1
Z00206	MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM: MTRCS	28	96 *	240 *	X	1
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E	28	243 *	98 *	L	1
C32887	CLEANER STEAM PRESSURE JET TRAILER MOUNTED:	29	146	72	J	1
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	29	45	24	X	2
G35851	GENERATOR SET DIESEL ENGINE TM: PU-803	29	165	95	K	1
G74711	GEN SET: DED SKID MTD 10KW 60HZ	29	62	32	X	1
H00654	HEATER: DUCT TYPE PORTABLE 350K BTU	29	65 *	72 *	J	1
P96640	PUMPING ASSEMBLY FLAMMABLE LIQUID BULK TRANSFER:	29	50	51	Q	1
T41135	TRUCK CARGO: MTV W/E W/W	29	279	96	G	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	29	180	86	A	2
T61908	TRUCK CARGO: MTV W/E	29	278	96	G	1
T94709	TRUCK WRECKER: MTV W/E W/W	29	360	96	C	1
T95555	TRAILER CARGO: MTV W/DROPSIDES M1095	29	232	96	K	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	29	132	86	J	1
V12141	TANK AND PUMP UNIT LIQUID DISPENSING TRUCKMOUNTING:	29	320 *	115 *	Q	1
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING:	29	66	75	Q	1

11307G600 6 SIGNAL NETWORK SUPPORT C

<u>LIN</u>	<u>LIN Description</u>	<u>Para</u>	<u>Length (Inches)</u>	<u>Width (Inches)</u>	<u>T/C Code</u>	<u>Quantity</u>
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	01	180	86	A	2
T61908	TRUCK CARGO: MTV W/E	01	278	96	G	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	01	132	86	J	1
W98825	TRAILER TANK: WATER 400 GALLON 1-1/2 TON 2 WHEEL W/E	01	163	98	K	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	02	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	03	180	86	A	3
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	03	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	04	180	86	A	1

SUSTAINMENT VEHICLES

T95992	LIGHT TACTICAL TRAILER: 3/4 TON	04	132	86	J	1
G42170	GEN SET DED TM: 10KW 60HZ MTD ONM116A2 PU-798	05	147	84	K	2
T07679	TRUCK UTILITY: HEAVY VARIANT HMMWV 4X4 10000 GVW W/E	05	191	86	A	4
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	06	180	86	A	3
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	06	132	86	J	3
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	07	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	07	132	86	J	1
G42170	GEN SET DED TM: 10KW 60HZ MTD ONM116A2 PU-798	08	147	84	K	2
T07679	TRUCK UTILITY: HEAVY VARIANT HMMWV 4X4 10000 GVW W/E	08	191	86	A	4
T61630	TRUCK UTILITY: EXPANDED CAPACITY 4X4 W/E HMMWV M1113	08	197	86	A	1
T95924	TRAILER CARGO: HIGH MOBILITY 1-1/4 TON	08	132	86	K	1
G42238	GEN SET DED TM: 5KW 60HZ MTD ON M116A2 PU-797	09	147	84	K	1
T07679	TRUCK UTILITY: HEAVY VARIANT HMMWV 4X4 10000 GVW W/E	09	191	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	09	132	86	J	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	10	180	86	A	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	11	180	86	A	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	11	132	86	J	1
G36237	GENERATOR SET DIESEL: 60HZ AC	12	30	23	X	1
T61494	TRUCK UTILITY: CARGO/TROOP CARRIER 1-1/4 TON 4X4 W/E (HMMWV)	12	180	86	A	3
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	12	132	86	J	<u>1</u>

Total Vehicles**281**

* Estimated value

THAAD VEHICLES**Category Code: 85210 Parking Area, Organizational Vehicles****Criteria**

The total pavement allowance under this category code is dependent on the type and size of facilities included in the maintenance complex; the parking area allowance is based on the quantity and size of organizational vehicles authorized (normally at strength level 1), to include the circulation aisle(s). The parking configuration utilized for calculation of the area needed is as follows:

1. Parking stalls are placed back-to-back with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles more than 18 feet long.
2. All circulation lane widths are 30 feet.
3. Trailers other than semitrailers are usually parked with their prime movers.
4. Side clearances for parking of vehicles are 3 linear feet. End clearances are 2 linear feet.
5. Unit integrity of parked vehicles is maintained where possible. However, partially filled parking rows will be filled by vehicles from the next organization.
6. POL vehicles are parked in a physically separated area in rows 50 feet apart, with a 10-foot clearance between vehicles.
7. Not used.
8. For category code 21410 Tactical Equipment Maintenance Facility (TEMF): The total area provided for these facilities includes facility aprons measuring 45 feet on all four sides of the facility. Additionally, a 20 foot wide circulation lane is provided on all four sides of the facility.
9. For category code 21470 - Oil Storage Building: The pavement associated with this building consists of apron only, as it is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. By using an assumed building length of 20 feet, and a fixed apron depth of 27 feet, each facility is assigned 84 square yards. Because this allowance is generally quite small, it is ignored in the computation below.
10. For category code 44224 - Organizational Storage Building: The pavement associated with this building consists of apron only, since the building is assumed to be sited adjacent to a circulation lane which is accounted for by other facilities. The apron area extends along the entire building length on one side. The computation used in the FPS assumes a building width of 25 feet, and a fixed apron depth of 27 feet.
11. For category code 44262 - Vehicle Storage Sheds: See the Basis of Calculation section below.

References:

Army Criteria Tracking System (ACTS)	28 Dec 2006
TI 800-01, Chapter 4	18 Mar 2002
DA PAM 415-28, Guide to Army Real Property Category Codes	11 Apr 2006
UFC 4-214-02, Tactical Equipment Maintenance Facility (TEMF) Standard Design	5 Oct 2007

Basis of Calculation:

The paved areas included under this category code consist of vehicle parking areas as well as the aprons and circulation lanes associated with each of the facilities located in a maintenance complex. The total pavement allowance is based on the type and size of the vehicles and facilities.

The parking allowances are based on the number and size of organizational vehicles authorized (usually at strength level 1). The initial step is to identify and separate these vehicles according to their parking needs. The calculation of hardstand pavement allowances is based on back-to-back parking stalls with access lane widths of 30 feet for vehicles less than or equal to 18 feet long and 45 feet for vehicles greater than 18 feet long. (For POL vehicles, see POL Vehicle Parking below.)

The Trigger/Counter (T/C) codes are as follows:

- A - Trucks, 5/4 ton or less
- B - Trucks, 2-1/2 ton
- C - Trucks, 5 ton
- D - Trucks, 8-ton and greater
- E - Trucks, Tractor

THAAD VEHICLES

F - Trucks, 2-1/2 ton, can haul TPUs
G - Trucks, 5-ton, can haul TPU's
J - Trailers towed by Truck Class A
K - Trailers towed by Truck Class B
L - Trailers towed by Truck Class C
M - Trailers towed by Truck Class D
N - Semitrailers
P - POL Tank Trucks
Q - TPUs and Trailer-mounted Fuel Tanks
S - POL Semitrailers
T - Tracked Vehicles
V - Class IX Supply Trailers (to be parked adjacent to warehouse)
W - Trailers towed by Truck Class A, can haul TPU's
X - Vehicles/Equipment which do not pull trailers
Y - Trailers towed by Truck Class B, can haul TPUs
Z - Trailers towed by Truck Class C, can haul TPU's

The vehicles and trailers with their length and width dimensions are identified by equipment Line Item Number (LIN). The POL (Petroleum, Oil and Lubricant) vehicles, including Tank and Pump Units (TPUs), and trailer-mounted tank units, are separated, and five-ton trucks and 1-1/2-ton trailers are allocated to transport the TPUs and the trailer mounted tank units. Class IX vehicles are also identified and separated, as they will be parked on the apron areas adjoining the warehouse and DS maintenance shop, and are not allowed additional hardstand. Other vehicles separated are the combat vehicles designated for parking in the vehicle storage sheds (category code 44262), which are authorized for Europe and Korea only. Subsequent to the identification of all vehicles, the trailers are matched with trucks by company, based on weight classifications.

The space allowance for parking the vehicles is based on a standardized layout conforming to the above criteria. Constant site width for each of the unique conditions was established based on a standard layout for the site structures. The parking stalls are then plotted mathematically, starting with the longest vehicle or vehicle/trailer combination in the first organization in the user's list, continuing through each organization, and going alternately from shortest to longest and longest to shortest vehicles.

The longest vehicle or vehicle combination in each row establishes the row width and the width of the access lane. Circulation lanes 30 feet wide extend along both sides of the hardstand.

POL Vehicle Parking

The POL vehicle parking area is presumed to be physically separated from the regular vehicle hardstand and is calculated separately. POL Semitrailers with tractor are allowed a 19-foot by 55-foot space with a 50-foot access lane. Other POL vehicles are assigned a 19-foot by 40-foot space with a 50-foot access lane. The computer program matches tractors and semitrailers to other POL Truck-trailer combinations prior to calculating space allowances.

Summary

The number of tactical vehicles and major equipment items in the planning base for organizational parking (category code 85210) plus the number of combat vehicles, radars, and major weapons systems in the planning base for vehicle storage sheds (category code 44262) equals the total number of major pieces of equipment for which space is provided in the maintenance complex. This is not equal to the total number of parking spaces, due to factors such as vehicle storage sheds in Europe and Korea, the pairing of trucks and trailers in single parking spaces based on pavement usage optimization, the diversion of Class IX storage vans to the area around the maintenance shop where they are more easily accessed by maintenance personnel, the mounting of TPU's on trucks or trailers, etc.

THAAD VEHICLES**Planning Base: Type, Size, and Number of Organizational Vehicles****Equipment Triggers and Counters:****44697G000 6 AMD BATTERY THAAD**

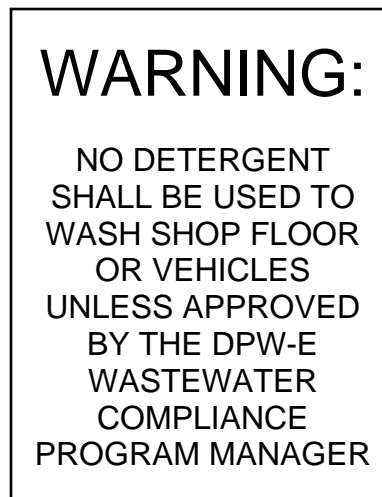
<u>LIN</u>	<u>LIN Description</u>	<u>Para</u>	<u>Length (Inches)</u>	<u>Width (Inches)</u>	<u>T/C Code</u>	<u>Quantity</u>
D82404	DECONTAMINATING APPARATUS: PWR DRVN LT WT	01	45	24	X	1
G36237	GENERATOR SET DIESEL: 60HZ AC	01	30	23	X	1
L28351	KITCHEN FIELD TRAILER MOUNTED: MTD ON M103A3 TRAILER TRUCK UTILITY: ECV ARMAMENT CARRIER W/IAP ARMOMR READY	01	171	92	K	1
T34704	M1151A1	01	197*	110*	A	1
T60081	TRUCK CARGO: 4X4 LMTV W/E	01	255	96	F	1
T61908	TRUCK CARGO: MTV W/E	01	278	96	G	1
T93761	TRAILER: PALLETIZED LOADING 8X20	01	306	96	M	1
T95992	LIGHT TACTICAL TRAILER: 3/4 TON	01	132	86	J	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	01	401	96	D	1
T96564	TRAILER FLAT BED: M1082 TRLR CARGO LMTV W/DROPSIDES	01	210	96	K	1
Z00206	MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM: MTRCS	01	96*	240*	X	1
Z36683	TRAILER TANK WATER (CAMEL): 800 GAL 5 TON W/E TRUCK UTILITY: ECV ARMAMENT CARRIER W/IAP ARMOMR READY	01	243*	98*	L	1
T34704	M1151A1	02	197*	110*	A	4
G74711	GEN SET: DED SKID MTD 10KW 60HZ	03	62	32	X	1
T41135	TRUCK CARGO: MTV W/E W/W TRUCK TANK: FUEL SERVICING 2500 GALLON 8X8 HEAVY EXP MOB	03	279	96	G	1
T58161	W/WINCH	03	401	96	P	2
T61908	TRUCK CARGO: MTV W/E TRUCK WRECKER: TACTICAL 8X8 HEAVY EXPANDED MOBILITY	03	278	96	G	1
T63093	W/WINCH	03	402	102	D	1
T95555	TRAILER CARGO: MTV W/DROPSIDES M1095	03	232	96	K	1
V12141	TANK AND PUMP UNIT LIQUID DISPENSING TRUCKMOUNTING:	03	320*	115*	Q	1
V19950	TANK UNIT LIQUID DISPENSING TRAILER MOUNTING: TRUCK UTILITY: ECV ARMAMENT CARRIER W/IAP ARMOMR READY	03	66	75	Q	1
T34704	M1151A1	04	197*	110*	A	1
P42126	POWER PLANT: ELECTRIC TRAILER MTD 30KW 50/60HZ AN/MJQ 40	05	165	95	L	2
T61704	TRUCK CARGO: MTV LWB W/E	05	352	96	G	4
T95924	TRAILER CARGO: HIGH MOBILITY 1-1/4 TON	05	132	86	K	4
Z00386	STATION SUPPORT GROUP (SSG): THAAD	05	429*	96*	B	4
Z35461	BATTERY LOGISTICS OPERATIONS CENTER (BLOC): THAAD	06	746*	96*	C	1
Z65468	MOBILE SUPPORT TRUCK (MST): THAAD TRUCK UTILITY: ECV ARMAMENT CARRIER W/IAP ARMOMR READY	06	196*	86*	A	2
T34704	M1151A1	07	197*	110*	A	1
T61239	TRUCK TRACTOR: MTV W/E	08	282	96	E	4
Z19584	COOLING EQUIPMENT UNIT: (CEU) RADAR	08	178*	98*	K	1
Z75894	PRIME POWER UNIT: (PPU) RADAR TRUCK UTILITY: ECV ARMAMENT CARRIER W/IAP ARMOMR READY	08	350*	96*	N	1
T34704	M1151A1	09	197*	110*	A	1
T96496	TRUCK CARGO: TACTICAL 8X8 HEAVY EXPANDED MOB W/LHS	10	401	96	D	3
Z82646	THAAD TRANSPORTER: (THAAD)	10	405*	113*	N	9

Total Vehicles**63**

* Estimated value

APPENDIX YY OIL WATER SEPARATOR SIGNAGE

FT Bliss Directorate of Environment
Oil/Water Separator (OWS) Signage



1. Sign: The oil/water separator (OWS) sign shall be approximately 2'-6" high by 2'-0" wide and white in color. Message lettering shall be all caps in black Helvetica and a minimum of 1-1/2" high. "WARNING" lettering shall be all caps in black Helvetica and a minimum of 3" high.
2. Quantities and area of placement: The Contractor shall provide a minimum of two (2) signs per building for small and medium TEMFs and four (4) signs per building for large and extra large TEMFs. There shall be no less than one (1) sign centrally located per every four repair bays (eight repair work areas) and with no less than one (1) sign per side of building.
3. Installation: Sign shall be permanently secured to the wall or structure with the bottom of sign at approximately 4'-0" above finished floor near the floor trench drains.

APPENDIX ZZ CONTRACT DURATIONS

CONTRACT DURATIONS
FROM SECTION 00 73 10 – COMMENCEMENT PROSECUTION & COMPLETION OF WORK

UNIT/BRIGADE	COF PAD SITE AVAILABILITY (1)	COF PERMANENT UTILITIES (2)	COF TEMPORARY WATER FOR FIRE PROTECTION (3)	COMPLETION DATE FROM NOTICE TO PROCEED (CALENDAR DAYS)
JLENS	N/A	N/A	N/A	530
SUSTAINMENT	N/A	N/A	N/A	454
THAAD	90	240	180	530

1 TEMF contractor shall provide the pad site for the COF complete for the COF contractor within the calendar days indicated.

2 TEMF contractor shall provide the permanent utilities for the COF (within the project limits shown) for the COF contractor within the calendar days indicated.

3 TEMF contractor shall provide the infrastructure for temporary water for fire protection during construction for the COF contractor (within the project limits shown) within the calendar days indicated.

4 Infrastructure work shall be in accordance with the infrastructure plans and specs provided as part of the RFP.

AM5 Note: Buildings to be demolished will not be available until 30 July 2010.